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OIL SHALE TRACT C-A

DECISION DOCUMENT

ON THE

DETAILED DEVELOPMENT PLAN

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March 3, 1849

PREPARED BY

AREA OIL SHALE OFFICE

CONSERVATION DIVISION

GEOLOGICAL SURVEY

U.S. Department of the Interior

PROTOTYPE OIL SHALE LEASING PROGRAM

OIL SHALE
TRACT C-A
(C-20046)

DETAILED DEVELOPMENT PLAN
DECISION DOCUMENT

SUMMARIZING AND DOCUMENTING THE
DEVELOPMENT PLAN REVIEW PROCESS
COMPLETED
BY

TECHNICAL STAFF
AREA OIL SHALE OFFICE
U.S.G.S.
CONSERVATION DIVISION

9/12/77

PHOTO COVERAGE OF

TRACT C-A

PHOTO 1: Aerial photograph of tract C-a showing major drainage features and existing road net. Photograph was taken early in Exploration Phase and recently disturbed drill sites are prominent. Overlay shows names of major drainages and a locator number and direction arrow for specific photographs on following pages.

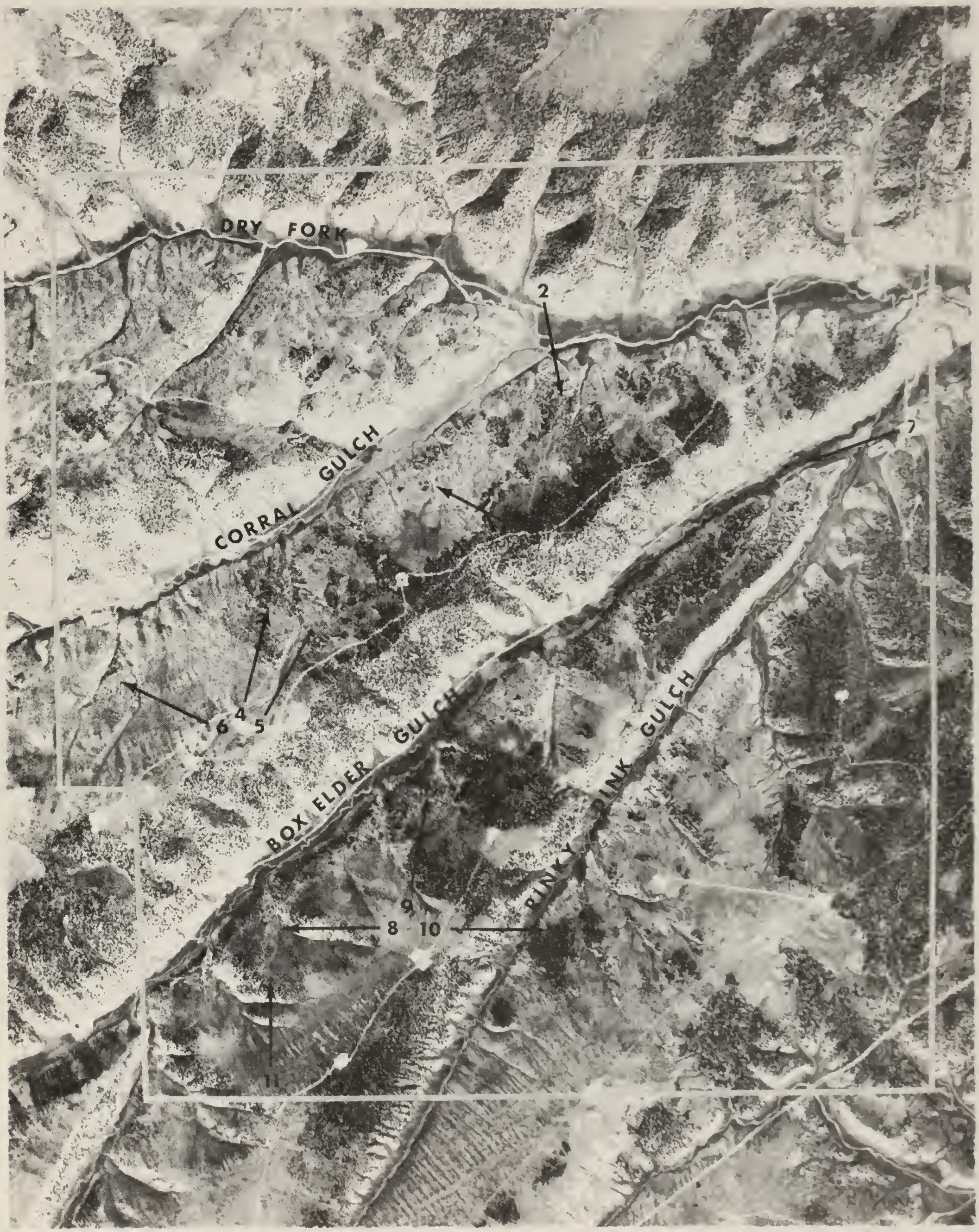

DRY FORK
2
CORRAL GULCH
7
6
4
5
BOX ELDER GULCH
PINKY DINK GULCH
9
8
10
11

PHOTO 2: View to south from north boundary of the tract across Corral Gulch. Modular Development Phase shafts and facilities will be constructed on top of ridge near center of photograph. Note sagebrush valley bottom and pinyon-juniper cover on the ridge tops.

PHOTO 3: View to northwest from site of Modular Development Phase mine area. Cathedral Bluffs are at the horizon with Corral Gulch in the center of picture.

PHOTO 4: View across Corral Gulch to the north. Commercial phase gas treatment and power generation facilities are planned to be constructed on the area in the foreground. The commercial phase plant site retention pond will be constructed in Corral Gulch in this area. The pond will have a diversion bypass for runoff from the upper part of Corral Gulch drainage.

PHOTO 5: View to the northeast from approximate location of commercial phase processing area. Base Cliffs are along Corral Gulch and Dry Fork at their intersection in the center of photograph. The Modular Development Phase shafts and facilities will be located on ridge at right center of picture.

PHOTO 6: View to northwest from commercial phase area. The tank farm, TOSCO retorts and sulphur plant will be located on the slope in foreground. Corral Gulch runs through the center of the photograph.

PHOTO 7: View to the west from east tract boundary. Rinky Dink Gulch Reservoir will be constructed in the drainage crossing the center of the photograph. This is the water control reservoir collecting drainage from the processed shale disposal pile.

PHOTO 8: View to the west across Box Elder Gulch from the truck load out area. Topsoil removed ahead of shale disposal will be stockpiled on the slope in the foreground.

PHOTO 9: View to the north across Box Elder Gulch. Photograph was taken from the approximate location of the commercial phase truck load out facilities for processed shale disposal. The Modular Devleopment Phase shafts and facilities will be located on the ridge across Box Elder Gulch just right of center in the picture.

PHOTO 10: View across Rinky Dink Gulch to the east. Photograph was taken from approximate location of the commercial phase truck load out facilities for processed shale disposal. Processed shale will be placed in Rinky Dink Gulch up the level of surrounding ridges. A dam will be built near the south boundary in Rinky Dink Gulch to divert runoff around the processed shale into Box Elder Gulch.

PHOTO 11: View to the north from southwest corner of tract across Box Elder Gulch. Crushed ore disposal from the early stage of the commercial phase will be on the ridge on the right front of picture. The commercial phase processing facility will be located on the ridge across Box Elder Gulch at center of picture.

PLAN AND REVIEW DOCUMENTATION

PHOTO 1: C-a Exploration Plan - submitted in May of 1974. Included description of the planned exploration activities and associated environmental protection procedures and the 2-year environmental baseline data collection program.

PHOTO 2: Copies of Rio Blanco County Master Plan and Rangely Master Plan. Plans were developed by local government through funding provided by Rio Blanco Oil Shale Project and through GOREDCO. In the case of GOREDCO the company worked with the Rangely city government to develop the plan with RBOSP paying GOREDCO's fee.

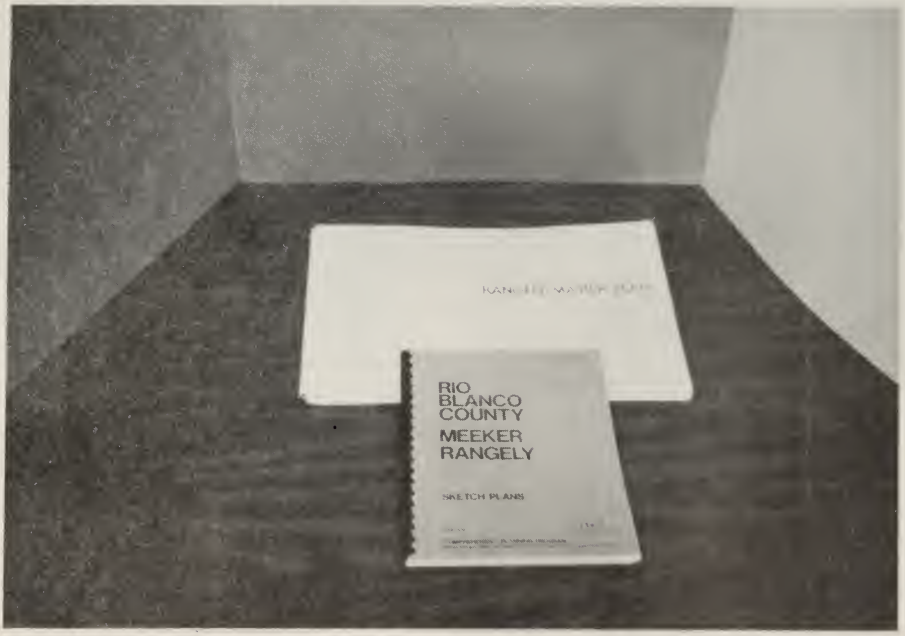
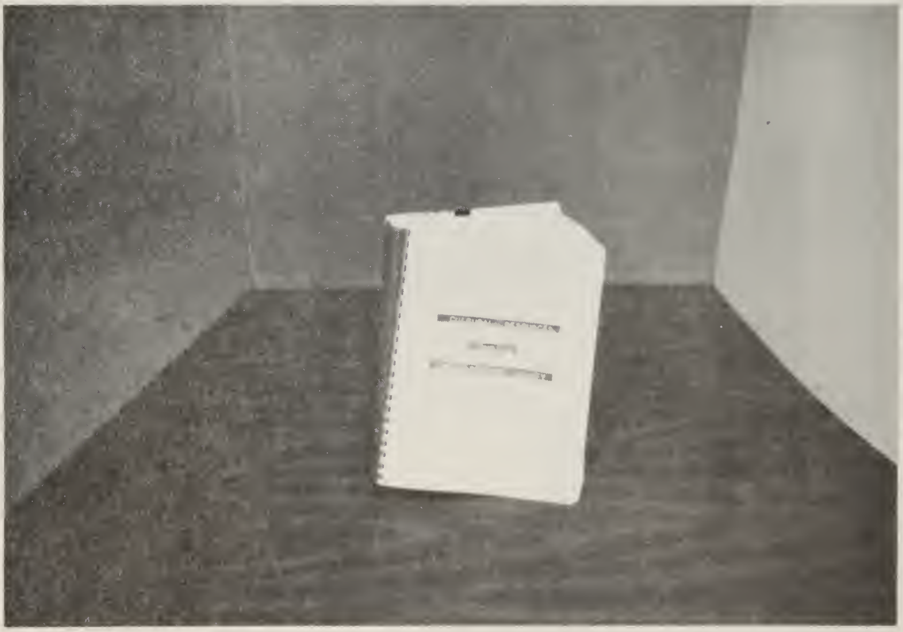

RIO
BLANCO
COUNTY
MEEKER
RANGELY
SKETCH PLANS

PHOTO 3: Two volume Annual Baseline Report submitted after collection of the first year of baseline data collection.

PHOTO 4: Cultural Resources Survey. A comprehensive report on the archaeological and historical sites on and around Tract C-a.



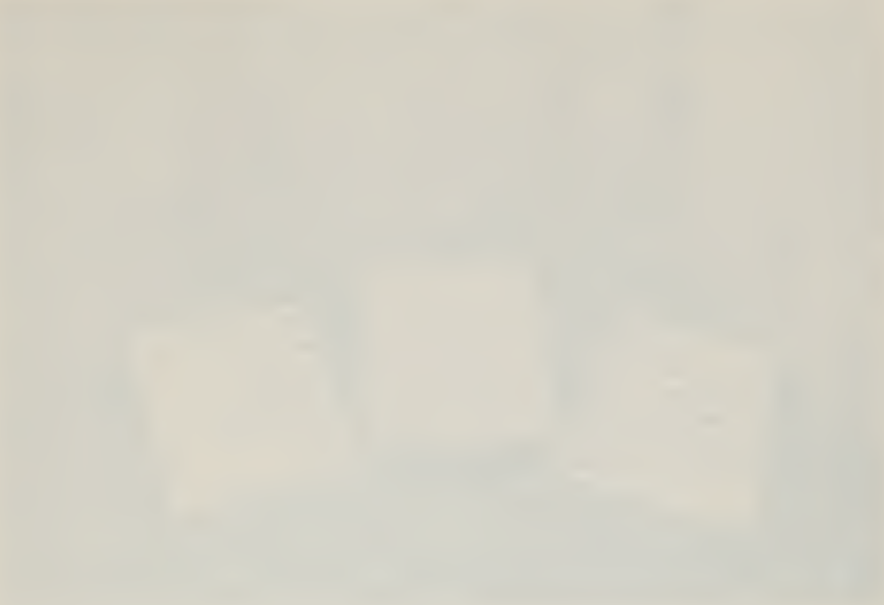


PHOTO 5: Special studies submitted by RBOSP. From left to right: (1) Social and Economic Impact Assessment submitted at the same time as the DDP. (2) An Evaluation of the soils of Tract C-a and adjacent areas. A detailed discussion of the chemical and physical characteristics of soil types found in the area and included a discussion of revegetation associations. (3) Fish and Wildlife Management Plan detailing the methods for avoiding, minimizing or mitigating Fish and Wildlife impacts during the exploration and baseline collection periods.

PHOTO 6: Summary Quarterly Progress Reports. In order to provide information to the public, the quarterly baseline reports were summarized and copies provided for distribution to a mailing list of Federal, State and Local government agencies as well as OSEAP and individuals. Nine summary reports and the first six month report on Interim Monitoring have been submitted.

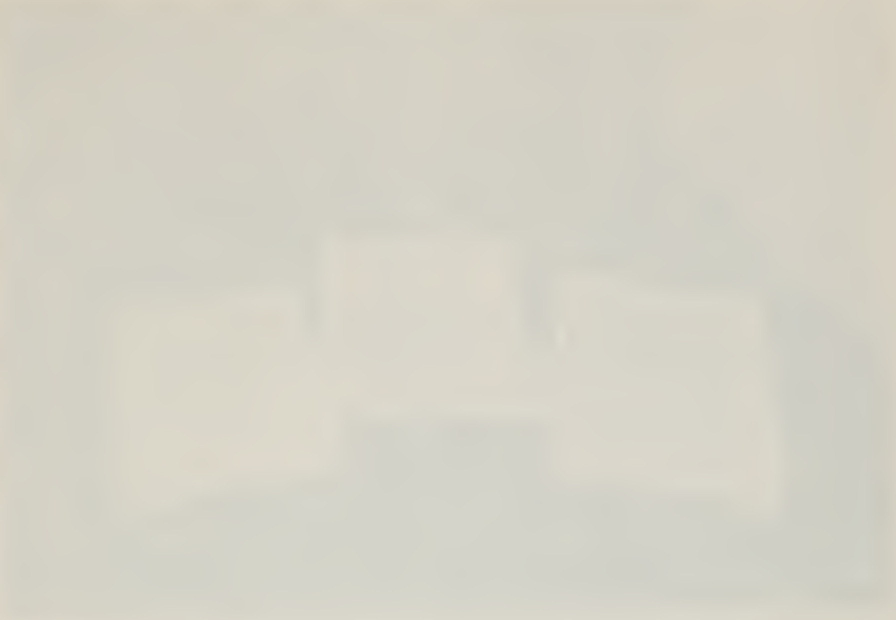


PHOTO 7: Three volume "Revised Detailed Development Plan" submitted in May 1977.

PHOTO 8: Two volume Final Environmental Baseline Report submitted in May 1977. Copies have been provided to OSEAP and a mailing list of interested governmental agencies and individuals.

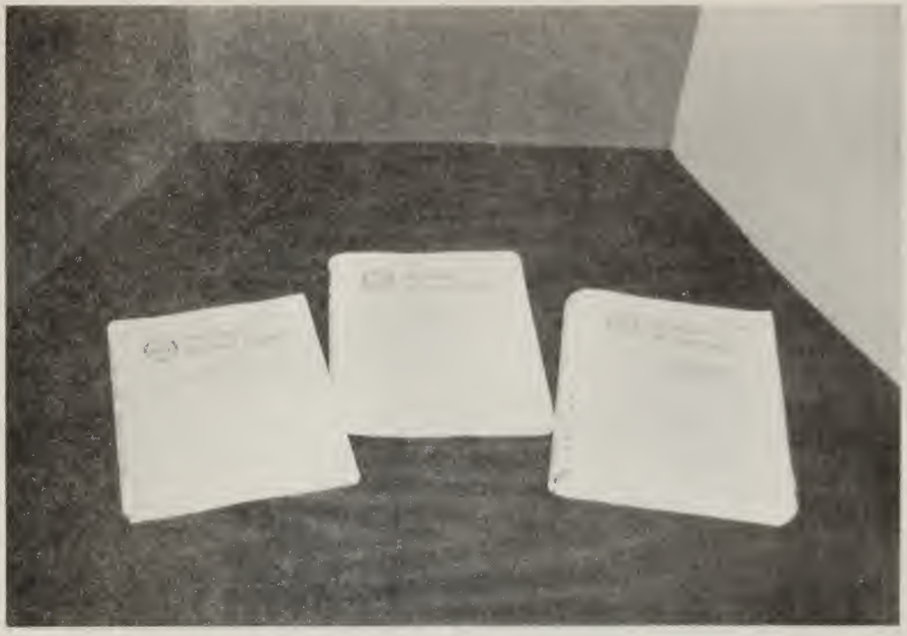
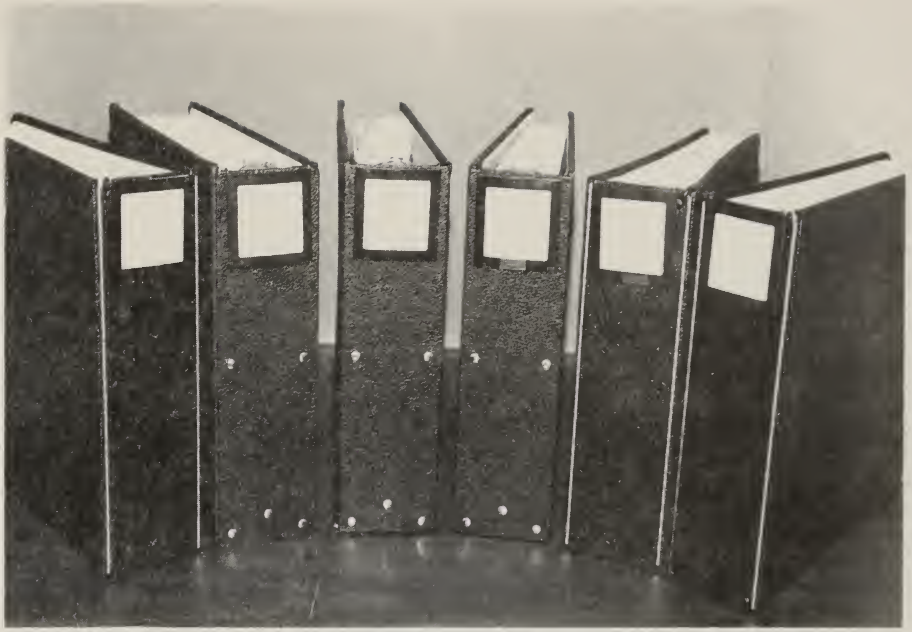


PHOTO 9: Detailed Quarterly Progress Reports on Environmental Baseline Collection. The lessee submitted these reports in duplicate. One copy is maintained as a file copy for staff use. The second copy is made available at the Area Oil Shale Office for public review and use. A check out procedure allows out of the office public review of these reports. Additional copies of hydrology, meteorology and air quality sections of the reports were distributed to the Colorado Department of Health and the Environmental Protection Agency.

PHOTO 10: Materials considered in arriving at decision on Detailed Development Plan approvability. Volumes contain the technical staff review of the Area Oil Shale Office, minutes of OSEAP meetings and concerning review of DDP; Hearing record of hearings held at Rangely and Denver, Colorado; specific comment letters received during the course of the review from OSEAP, State of Colorado, other governmental agencies, industry, special interest groups, and the public.



MEMORANDA

OF

TRANSMITTAL

OF

DECISION DOCUMENT

United States Department of the Interior

GEOLOGICAL SURVEY
Conservation Division
Area Oil Shale Supervisor's Office
Mesa Federal Savings & Loan
131 N. 6th, Suite 300
Grand Junction, Colorado 81501

September 12,1977

Memorandum

To: Chief, Conservation Division

Through: Conservation Manager, Central Region

From: Area Oil Shale Supervisor

Subject: Approval of Detailed Development Plan for Oil Shale Tract C-a

The Area Oil Shale Office has completed the review of the Tract C-a Detailed Development Plan. The review incorporated input from staff members and all comments from individuals and agencies were considered. This review has been reduced to the attached decision document which evaluates the issues raised.

Based on the issues presented in the decision document, supplementary material to be incorporated into the plan was required of the lessee and a list of eleven Conditions of Approval for the plan were developed.

All required environmental baseline studies have been completed by the lessee and reports have been submitted timely.

The Oil Shale Environmental Advisory Panel has reviewed and commented on the plan. Their comments have been included in the review and are addressed by the supplementary material and Conditions of Approval.

The State of Colorado has provided comments on the plan and a procedure has been established to maintain consultation and coordination with the State during the permit application process and future operations on the leased lands.

Issues raised during the review process were responded to in three ways. Where direct answers or clarification provided by either the lessee or this office would resolve the question, they were provided, and where appropriate incorporated into the plan through the supplementary material.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

Where additional detail was required or where programs based on studies to be carried out during early phases of operations were the only feasible means of obtaining answers to questions, they were presented in the supplementary material and made mandatory, both as to substance and timing through Conditions of Approval. Where answers to questions could only be obtained through final detailed design based on findings from initial operations, or from the outcome of the various separate permit stipulations, the submittal of these designs and plans for review and approval was made mandatory. These actions and the issues they apply to are presented in the attached Decision Document.

Major issues addressed during the review of the plan and their resolution include the following:

Water quality concerns were related to the effect on ground water of spent retorts. The lessee has submitted a program to quantify retort water composition, spent retort minerology, retort leachability and restabilization of spent retorts by backfilling with surface retorted shale. A Condition of Approval makes this program mandatory during the modular phase and requires that the abandonment plan be supplemented based on the program results prior to commercial phase development. Also submitted is a program to quantify the related issue of subsidence. In response to comments on the monitoring program, a detailed scope of work was submitted for monitoring during the modular phase, and a Condition of Approval requires that the monitoring program be revised based on the second year's environmental baseline report and thereafter as information becomes available.

As with Tract C-b, demands for an additional impact statement, either site specific or regional, have been made at every public hearing held under the program irregardless of the plan of operations under debate. The Secretary stated in his decision document that "the Department does not plan to issue any further environmental statements on any phase of the Prototype Program." An additional statement was planned based on results of prototype operations before any further leasing took place. The environmental statement does cover both surface mining/surface retorting, underground mining/surface retorting and in situ development of Tract C-a. The use of conventional mining methods to create permeability for in situ processing was acknowledged in Volume I of the EIS. In fact, modified in situ is a combination of conventional mining methods presented in the EIS and in situ processing presented in the EIS.

Our review has shown that no new impacts are anticipated from operations under the development plan over those presented in the EIS. The degree of impact is consistent with that presented in the EIS. Since the prototype program was designed to provide answers to issues of environmental, technical and economic feasibility of oil shale development through operations on the leased tracts, an EIS at this time would not provide significant further detail or resolution of these issues.

In view of the fact that an additional EIS at this time would draw primarily on data from the prototype program, which has all been made public and has been subject to public debate through OSEAP and public hearings, and the above discussion on anticipated impacts and technology, we believe that an additional EIS at this time would not provide us or the public with any significant new information, and would serve to delay implementation of the program to find answers.

Based on the results of the review process, I have determined that the Tract C-a Detailed Development Plan with the supplementary material and conditions of approval meets the terms and conditions of the Oil Shale Lease and the goals of the prototype program.

I have also determined that the plan is adequate as a management tool for supervision and regulation of operations on the lease tract.

I therefore recommend that the Tract C-a Detailed Development Plan be approved subject to the inclusion of the supplementary material and conditions of approval.

Peter A. Rutledge

Attachments

PROPOSED

DETAILED DEVELOPMENT PLAN

APPROVAL LETTER

WITH

CONDITIONS

United States Department of the Interior

GEOLOGICAL SURVEY
Conservation Division
Area Oil Shale Supervisor's Office
Mesa Federal Savings & Loan
131 N. 6th, Suite 300
Grand Junction, Colorado 81501

DRAFT

Oil Shale Tract C-a
Lease C-20046

Mr. J. Blaine Miller, President
Rio Blanco Oil Shale Project
9725 E. Hampden Avenue
Denver, Colorado 80231

Re.: Approval of the Detailed
Development Plan for Tract C-a

Dear Mr. Miller:

The Area Oil Shale Office has completed review of the Detailed Development Plan for Tract C-a. The Plan consists of the "Revised Detailed Development Plan" for Tract C-a submitted by you May 25, 1977 and the supplementary material you submitted September 2, 1977. We have also reviewed other material you have submitted and comments and material provided by the public and agencies of local, state and Federal governments. I have determined that the Detailed Development Plan for Tract C-a is acceptable and hereby approve the same subject to the terms of the Conditions of Approval set forth in Attachment A.

Upon the execution by you of this letter of approval and subject to the Conditions of Approval attached, you may proceed with the development of Tract C-a pursuant to the approved Detailed Development Plan.

Approval of the Detailed Development Plan does not constitute a waiver on the part of the United States of any rights accruing to it under any pertinent statutes or regulations or any of the lease terms, nor does it relieve the lessees from any obligations imposed by such statutes, regulations or lease terms.

This approval of the Detailed Development Plan does not convey any rights to public lands off the lease tracts. Separate permits are required from the Bureau of Land Management for any off-tract facility. Further, approval of the Detailed Development Plan is subject to the lessees obtaining all required permits, at the appropriate time during tract development, copies of which shall be filed with the Area Oil Shale Office. This approval is also subject to the lessee's compliance with all applicable Federal, state and local statutes, regulations, standards and permits.

All development and environmental control work on tract must proceed in accordance with the approved Detailed Development Plan. Should it become necessary to further modify or change the Detailed Development Plan, any such changes must first be approved in writing by the Mining Supervisor pursuant to Section 10(b) of the Lease.

The approved Detailed Development Plan is subject to revision pursuant to Lease Environmental Stipulation 1(c)(1), following review and analysis of the second year's environmental baseline data and final baseline data report by the Mining Supervisor.

Prior to commencing any operations under the approved plan, an additional bond in the amount of $300,000 must be filed with the Bureau of Land Management pursuant to Section 9(b)(1) of the Lease.

Sincerely yours,

PETER A. RUTLEDGE
Area Oil Shale Supervisor

Date

CONDITIONS ACCEPTED

Gulf Oil Corporation

Date

Standard Oil Company (Indiana)

Date

DRAFT

Attachment A

Conditions of Approval

1. Prior to commencing any operations under the Modular Development Phase of the Detailed Development Plan (DDP), the lessee shall submit final design plans, as requested by the Mining Supervisor, for his review, as to adherence to the DDP, to the terms of the Oil Shale Lease, and to the requirements of 30 CFR Part 231 and 43 CFR Part 23 or any subsequent applicable revisions thereof.

2. Prior to commencing construction of Commercial Phase facilities, the lessee shall submit plans, as required by the Mining Supervisor, for his review and approval as to adherence to the plan of action contained in the DDP, to the terms of the Oil Shale Lease, and to the requirements of 30 CFR Part 231 and 43 CFR Part 23 or any subsequent applicable revisions thereof.

3. Per lease environmental stipulation 1(c)(1), the Modular Development Phase Monitoring Program of August 17, 1977 shall be revised as needed, based on analysis of the final baseline report, and thereafter as further information becomes available. Prior to Commercial Phase operations, a detailed Commercial Phase Environmental Monitoring Program shall be submitted for review and approval.

4. In addition to presentation of environmental monitoring data collected before, during and subsequent to development operations in required annual reports, lessee shall make available to the Mining Supervisor environmental monitoring and other data at such time and in such format as he may reasonably require.

5. The lessee will incorporate the best available environmental control technology in all phases of the Modular and Commercial development. Environmental control plans shall be reviewed and revised, as needed, prior to implementation of the Commercial Phase development.

6. Prior to Commercial Phase operations, surface processed shale disposal plans shall be evaluated in consideration of optimizing the revegetation schedule with pile development. The lessee shall continue to evaluate the alternative for underground disposal of processed shale.

7. Emission modeling and detailed air quality control plans for the Commercial Phase will be submitted to the Mining Supervisor for review prior to implementation of Commercial Phase development. This submittal should consider the "Minimum Guidelines for the Detailed Development Air Pollution Control Plans and Modeling" furnished by letter of April 14, 1977, the results of tracer studies, Modular Development Phase emission experience, and cumulative emissions as appropriate.

8. As additional information becomes available, the abandonment plan contained in the DDP shall be updated to provide greater detail on retort retirement and stabilization based on the retort integrity study. This information shall be submitted to the Mining Supervisor for review and approval prior to Commercial Phase retort development, and shall emphasize stabilization of in situ retorts and control of ground water and leaching of the spent retorts.

9. The lessee shall implement the proposed research proposal for modified in situ retort integrity provided in the supplemental material to the DDP. The study will emphasize the solubility and mobility of trace and toxic constituents in spent shale and the effects of leaching on the load bearing strength of the rubble filled retort chambers. Prior to commercial operations, a report on the mineralogy and leachability of in situ processed shale on Tract C-a will be submitted.

10. The lessee shall investigate the economic and technical feasibility of alumina recovery from dawsonite-bearing oil shale on Tract C-a during the mining of commercial size retorts during the Modular Development Phase. A report on the results of this investigation shall be submitted to the Mining Supervisor prior to commercial production.

11. The lessee shall maintain a program of continuing observation for items of historic, prehistoric, or scientific value during construction and tract operations. The reporting of uncovered objects shall be in compliance with Section 6 of the Oil Shale Lease Environmental Stipulations. The lessee shall also comply with the measures to avoid adverse effects to sites which qualify for the National Register of Historic Places in the August 16, 1977 "Determination of Effect, C-a Oil Shale Tract, Northwestern Colorado" prepared by the Colorado State Office of the Bureau of Land Management.

DECISION DOCUMENT

SUMMARY OF

REVIEW PROCESS

ISSUES

MITIGATIONS

AND

RECOMMENDATIONS

DECISION DOCUMENT

Detailed Development Plan
Rio Blanco Oil Shale Project
Gulf Oil Corporation and Standard Oil Company (Indiana)
Oil Shale Tract C-a
Lease C-20046
Rio Blanco County, Colorado

Prepared By

U.S. Geological Survey, Conservation Division
Area Oil Shale Supervisor's Office
131 N. 6th - Suite 300
Grand Junction, Colorado 81501

September 12, 1977

DECISION DOCUMENT

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Appendix A: "Revised Detailed Development Plan"

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DECISION DOCUMENT

Detailed Development Plan
Rio Blanco Oil Shale Project
Gulf Oil Corporation & Standard Oil Co. (Indiana)
Oil Shale Tract C-a
Lease C-20046

Introduction

This document is the result of an orderly and thorough review of the "Revised Detailed Development Plan" (Appendix A) submitted to the U.S.G.S. Area Oil Shale Office by the lessees of federal oil shale lease tract C-a. The evaluation will address the technical adequacy and compliance with lease terms, including environmental protection. This document represents the ultimate decision on the part of the Mining Supervisor as to the approvability of the detailed development plan, in appreciation of the opinions and technical advice of the staff of the Area Oil Shale Office, the Oil Shale Environmental Advisory Panel, the State of Colorado, other governmental agencies, industry, special interest groups, and the public. The outline of the Decision Document consists of five parts: (1) Prototype Program; (2) Environmental Impact Statement; (3) Oil Shale Lease; (4) Detailed Development Plan Review; and (5) Recommendations.

Part I is a summary of the objectives of the federal prototype oil shale leasing program. Oil shale tract C-a is presented as a part of the scope of the program.

Part II summarizes the development of the Final Environmental Statement for the Prototype Oil Shale Leasing Program. Tract C-a is specifically addressed in the environmental statement and this decision document supports the statement.

Part III is a detailed discussion of the oil shale lease. The lease and attached environmental stipulations which were developed for the prototype oil shale leasing program and presented in the environmental statement is reviewed. The environmental stipulations are discussed as they apply to specific aspects of the environment.

Part IV presents the Detailed Development Plan submitted by the lessees of tract C-a and summarizes the issues and comments identified during the review process of the plan. The DDP is summarized in a format that responds to the requirements of the lease and focuses on the development as it relates to specific aspects of the environment. The review process included technical staff review; consultation with the Oil Shale Environmental Advisory Panel and State of Colorado; public hearings; and distribution of the DDP to governmental agencies, industry, special interest groups, and the public. Responses to the major issues identified during the review are also presented in this part of the Decision Document.

Part V is the recommendation of the approvability of the Detailed Development Plan submitted by the lessees. This recommendation represents an evaluation of the preceding parts of this Decision Document. Conditions of Approval are incorporated in this part, if the DDP is acceptable.

An Appendix includes the three volume "Revised Detailed Development Plan" (Appendix A) and supplemental material (Appendix B) which was submitted by the lessees and is to be attached and considered a part of the DDP.

I. Prototype Program

A. Goal and Objectives

The Prototype Oil Shale Leasing Program was developed in response to a Presidental energy message of June 4, 1971, in which he requested the Secretary of the Interior to initiate "a leasing program to develop our vast oil shale resources, provided that environmental questions can be satisfactorily resolved."

The objectives of the program, stated by the Secretary of the Interior are:

1) to provide a new source of energy that will increase the range of energy options available to the Nation by stimulating the timely development of commercial oil shale technology by private industry;
2) to insure the environmental integrity of the affected areas, and concurrently, define, describe, and develop a full range of environmental safeguards and restoration techniques that can be reasonably incorporated into the planning for a possible mature oil shale industry in the future;
3) to permit an equitable return to all parties in the development of this public resource; and

4) to develop management expertise in the leasing and supervision of oil shale resource development in order to provide the basis for future administrative procedures.

B. Scope

The prototype program was formulated to make available for private development under carefully controlled conditions, a limited number of leases (six) of not more than 5,120 acres each. Such leases would be sold by competitive bonus bidding subject to rental and royalty obligations to the United States. Additional oil shale leasing will not be considered until development under the prototype program has been satisfactorily evaluated in terms of the program objectives.

Federal oil shale tract C-a, for which this document is prepared, is a part of this prototype program. Tract C-a was selected for leasing by the Department of the Interior on April 25, 1972 from twenty individual tract nominations. Two tracts in each state of the oil shale region (Colorado, Utah, and Wyoming) were selected in consultation with the three State governments involved. Tract C-a was subsequently leased on January 8, 1974 (effective date of March 1, 1974) for a bonus bid of $210,305,600. The Wyoming tracts were not leased, since no bids were received.

C. Program Management

In order to comply with the goal and objectives of

the prototype program, the Area Oil Shale Office was established in June of 1974 within the Central Region of the Conservation Division, U.S. Geological Survey to administer the program. The Area Oil Shale Office (AOSO) is greatly assisted by the Oil Shale Environmental Advisory Panel (OSEAP) which was created to advise Department officials on environmental aspects of the prototype program. This Decision Document was prepared by the Area Oil Shale Office in response to its management responsibilities. The Oil Shale Environmental Advisory Panel and the State of Colorado have reviewed the subject Detailed Development Plan and provided comments for consideration in the Decision Document.

II. Environmental Impact Statement

A. Background

A Final Environmental Impact Statement for the Prototype Oil Shale Leasing Program was prepared by the Department of the Interior, pursuant to Section 102 (2) (c) of the National Environmental Policy Act of 1969, and filed with CEQ on August 30, 1973. The draft of this statement was released to the public on September 7, 1972 and a public review period was held that ended on November 7, 1972. The statement was a study of the environmental impacts of oil shale development and considered the regional impacts of a one million barrel per day industry, specific impacts from development of the six selected lease tracts, and methods of shale oil production including conventional underground and open pit mining with surface retorting and in situ processing of oil shale.

B. Analysis

The Final Environmental Impact Statement consists of six volumes. Volume I provides an assessment of oil shale technology, including in situ processing, and describes the regional environmental impact of oil shale development at a rate of one million barrels per day by 1985. Volume II extends the study with an examination of alternatives to the one million barrel per day level of shale oil production. Volume III examines the specific issuance of not more than

two prototype oil shale leases, including tract C-a, in each of the three states of Colorado, Utah, and Wyoming. Its focus is on the specific environmental impacts of prototype development on public lands which, when combined, could support a production potential of about 250,000 barrels per day.

Volume IV describes the consultation and coordination with others in the preparation of the final statement, including comments received and the Department's responses. Letters received during the review process are reproduced in Volume V and oral testimony is contained in Volume VI. Inspection copies of the final environmental statement are available in the U.S. Department of Interior (Washington, D.C.); Bureau of Land Management State and District Offices in Colorado, Utah, and Wyoming; Area Oil Shale Office; Oil Shale Environmental Advisory Panel office; and at depository libraries located throughout the Nation.

The final environmental statement summarizes that oil shale development would produce both direct and indirect changes in the environment of the oil shale region. Many of the environmental changes would be of local significance, and others would be of an expanding nature and have cumulative impact. These major regional changes would conflict with uses of the other physical resources of the areas involved. Impacts would include those on the land itself, water resources

and air quality, fish and wildlife habitat, grazing and agricultural activities, recreation and aesthetic values, and on the existing social and economic patterns as well as others.

C. Tract C-a

A description of tract C-a, mining and processing options, and the impacts and unavoidable adverse effects of development on tract C-a are presented in Volume III of the Final Environmental Statement for the Prototype Oil Shale Leasing Program. The environmental statement considered three technical options for extraction of shale oil from tract C-a:

1) underground mining and surface processing
2) surface mining and surface processing, and
3) in situ processing by surface well extraction.

Modified in situ development, as proposed in the Detailed Development Plan, can be considered as a refined combination of the underground mining and in situ processing technologies.

The use of coventional mining techniques to create the permeability required for in situ shale oil production was acknowledged in the EIS in Volume I, P. I-36 and P. I-94.

The impacts addressed for development of tract C-a include land requirements, processed shale disposal, surface subsidence, and off-tract land uses. The impacts on particular

plant communities or vegetative types is addressed, as well as; private ranch lands and cultural features; surface and ground water impacts; potential air pollution from particulates, sulfur dioxide, nitrogen oxides, light hydrocarbons, and carbon monoxide; and noise impacts. The destruction of wildlife habitat is presented and includes mule deer, elk, wild horses, sage and blue grouse, jack rabbits and cottontails, rodents and small animals, and raptors and predatory mammals. Grazing use of the area would be impacted and the recreation and aesthetic values reduced. Rangely, Colorado might be expected to be most severely impacted by development of tract C-a and Rifle, Colorado could become a railroad distribution center.

III. Oil Shale Lease

An oil shale lease was developed for the prototype oil shale leasing program and is presented as part of the proposed action in the final environmental statement. The lease supplements the Department's regulations governing surface exploration, mining and reclamation of lands (43 CFR Part 23) and the operating regulations for mining (30 CFR Part 231).

The format of the lease includes the lease proper and fourteen (14) environmental stipulations which are attached to and specifically incorporated in the lease. These special stipulations were developed for the prototype oil shale program and place additional requirements on the lessee to insure that the environmental impact in the immediate and adjacent area of the development would be minimized. Three lease revisions have been approved based on the experience gained in administering the oil shale tracts under the prototype program. These revisions related to sampling for air quality and meteorological evaluation, and studies of flora and fauna.

The following discussion summarizes some of the significant areas of the lease and stipulations as they apply to individual aspects of the environment. Oil Shale Lease C-20046 should be consulted for specific statutory details pertaining to the following discussion. The Detailed

Development Plan was reviewed and evaluated with respect to the lease and is summarized in Part IV of this Decision Document. Part IV review areas, corresponding to the below described lease terms, are indicated in (parenthesis). Required actions completed by the lessee during the two year environmental baseline data gathering period are indicated by (*).

A. Land Surface, Geology, and Soils

Section 2 of the lease grants the lessee the right to prospect for, mine by underground or surface means, and process by retorting or by in situ methods all of the leased deposits. The lessee is also granted the right to construct all works, buildings, plants, structures, roads, powerlines, employee housing, and additional facilities as may be necessary for the mining, processing, and preparation of products for market. (4.0, 5.0, 7.0).

The lessee is required by Section 11 of the lease to conduct all operations in accordance with all applicable Federal, State, and local land reclamation statutes, regulations, and standards; and to avoid or minimize damage to the land. Section 12 further requires the lessee to avoid wasting the mineral deposits and surface resources on the leased lands. Operations shall be conducted in such a manner as to avoid or minimize damage to improvements on the leased lands. (8.0-8.11).

Section 13 of the lease states that any entry, well, or opening for in situ operations shall not be within 500 feet of the lease boundary and induced fracturing shall not extend to less than 100 feet from the boundary. (3.0, 4.0, 5.0).

The lessee is required by Section 1(C)2 of the environmental stipulations to collect data and conduct a monitoring program for soils and their productivity. (*, 2.3, 10.0).

Section 11 of the stipulations requires an erosion-control and surface-rehabilitation plan as part of the development plan. The lessee is required, in accordance with such an approved plan, to rehabilitate all affected lands to a usable and productive condition consistent with or equal to pre-existing land uses in the area and compatible with adjacent undisturbed areas. Areas susceptible to slides and slips, excessive settlement, severe erosion, and soil creep must be avoided where possible. Waste rock from the mining operations must be utilized for roadbeds, fills, and other construction purposes when possible. Additional gravel and other construction materials will be purchased in accordance with 43 CFR 3610 (Mineral material sales). All cut and fill slopes will be maintained in a stable condition. (8.10).

Section 14 of the environmental stipulations requires the reclamation and compaction of excavated material and processed shale to minimize erosion. The slope faces of waste piles will be designed to insure slope stability and will be revegetated in accordance with the plan. All waste will be disposed of in accordance with applicable standards and guidelines of the State, U.S. Public Health Service, and the Environmental Protection Agency. The disposal system must be designed and constructed to avoid landslides, control erosion, and establish conditions conducive to vegetative growth. No disposal of waste can create an impoundment of water unless specific plans are approved by the Mining Supervisor. Impoundments will be required for slurry waste disposal systems. (8.10).

B. Water Resources

The lessee is required by Section 11 of the lease to conduct operations in accordance with all applicable Federal, State, and local water pollution control and water quality statutes, regulations, and standards; and avoid or minimize damage to the water resources. Section 12 provides that water rights developed through operations will become the property of the lessor, but the lessee shall have the right to use those waters for activities under the lease. (8.2).

The lessee is required by Section 1(C)2 of the environmental stipulations to collect data and conduct a monitoring program for surface and ground water. Springs and seeps shall be monitored. (*,2.3, 10.0).

Section 9 of the stipulations requires the lessee to conduct operations in accordance with all applicable Federal and State water-quality standards. The Mining Supervisor must approve all disturbances of existing waters. Surface water and ground water will be diverted from operations so as to avoid the formation of toxic and saline water and its drainage into streams. Refuse and spent shale will be disposed of in a manner which will avoid the discharge of toxic drainage of saline water. Spoil and refuse will be monitored for the presence of materials likely to yield alkaline, acidic, saline, or toxic solutes. No water will be reinjected, except in compliance with Federal and State standards and as authorized by the Mining Supervisor. (8.2, 10.0).

This stipulation also states that cuts and fills will not result in siltation of streams. All stream crossings must be approved by the Mining Supervisor. Buffer strips at least 200 feet (61 m) wide must be maintained in their natural state on each side of a stream. The Mining Supervisor must approve all road surfacing materials. (7.0).

Section 11 requires that safe access will be provided to permanent water impoundments for persons, livestock, and wildlife. Access must be prevented to such water sources if they are of harmful quality. Improvements or operations must not be conducted in flood plains without the express permission of the Mining Supervisor and without providing for protection of any such improvements. Section 1(F) requires that impoundments be constructed to withstand a 100-year flood. (8.2, 8.11).

C. Vegetation

The lessee is required by Section 12(C) of the lease to avoid or minimize and repair damage to forage and timber growth, and crops. (8.9, 8.10).

Section 1(C)2 of the environmental stipulations requires the lessee to conduct a data collection and monitoring program of the flora on the leased lands and within a mile of the lease. (*, 2.3, 10.0).

Section 11 of the stipulations requires the lessee to rehabilitate all affected lands according to an erosion-control and surface-rehabilitation plan approved by the Mining Supervisor. Revegetation must be initiated not later than 1 year after completion of a particular operation. Topsoil must be saved and used for rehabilitation. Permanent vegetation must be restored to disturbed areas. The Mining Supervisor may require the lessee to fence areas to assist revegetation. (8.10).

The lessee must initiate a revegetation program at the start of production and must demonstrate at the time he submits the detailed development plan that revegetation technology can meet these stipulations. If the required technology cannot be demonstrated, a program must be initiated to obtain the required technology. If the lessee has not demonstrated the necessary revegetation technology by the tenth anniversary date of the approved development plan, the lessee must cease all development and production operations until he has demonstrated that the technology is available. (8.10).

The clearing and use of timber and other vegetative material is restricted by section 13 of the stipulations. No cutting or removal is permitted outside marked clearing boundaries. All trees cut will be felled into the right-of-way and away from live water courses. Clearing and grubbing limits will be approximately 5 feet (1.5 m) outside the edge of any cut or fill. Trees, snags, stumps, or other woody material not having wildlife value or value to the lessee will be mechanically chipped and spread to encourage revegetation and to stabilize soil. Clearing boundaries will be identified on the ground prior to clearing operations. Roadbeds will be cleared no more than 25 feet (7.6 m) from the centerline unless otherwise specified by the Mining Supervisor. (7.0, 8.10).

D. Wildlife

The lessee is required by Section 1(C)2 of the environmental stipulations to conduct a data collection and monitoring program of the fauna on the leased lands and within a mile of the lease. Aquatic habitat shall be monitored as far downstream as the Mining Supervisor shall require. (*, 2.3, 8.9, 10.0).

A detailed fish and wildlife management plan is required as part of the detailed development plan under section 4 of the environmental stipulations. The plan must include steps to minimize damage to habitat, restore damaged habitat, provide alternate habitats, and provide controlled access. Wherever destruction or significant disturbance of fish and wildlife habitat is unforeseen in the detailed development plan, the lessee must submit, for the Mining Supervisor's approval at least 60 days before the destruction or damage of habitat, those measures that the lessee proposes to take in order to mitigate the damage. Big game drift fences shall be constructed, when and where necessary, to direct big game movements around development areas. The lessee must post notices informing employees of all applicable laws and regulations governing hunting, fishing, and trapping. (8.9).

Section 11 requires the lessee to restore the vegetation of disturbed areas by reestablishing permanent

vegetation of a quality that will support fauna of the same kinds and in the same numbers as those existing at the time the baseline data was collected. (8.10).

The lessee is required by section 2(I) of the stipulations to design and construct all electric transmission lines for raptor protection in accordance with REA Bulletin 61-10. (7.0).

E. Agriculture and Range

Section 12(c) of the lease requires the lessee to avoid or minimize and repair damage to crops and improvements on the leased lands. (8.9, 8.10).

Sections 2(J) and (K) of the stipulations require the lessee to construct fences and cattleguards according to BLM specifications and standards. (7.0).

Section 3 requires the lessee to make every reasonable effort to prevent, control, and suppress any fire on the leased lands. The lessee must also comply with the National Fire Codes on handling, transportation, storage, use, and disposal of flammable liquids, gases, and solids. The control and suppression of any fires caused by the lessee will be at the expense of the lessee. (8.4).

Pesticides and herbicides cannot be used without the approval of the Mining Supervisor and in accordance with applicable Federal and State procedures under section 7 of the environmental stipulations. (8.2, 8.11).

The lessee will establish safe access to permanent water impoundments for livestock and wildlife under section 11 (H) of the stipulations. (8.11).

F. Air Quality and Meteorology

The lessee is required by Section 11 of the lease to conduct operations in accordance with all applicable Federal, State, and local air pollution control and air quality statutes, regulations, and standards; and avoid or minimize damage to the air resources. (8.1).

Section 1(C)2 of the environmental stipulations requires an air quality data collection and monitoring program. (*, 2.3, 10.0).

Section 8 of the stipulations requires the lessee to comply with all air-quality standards adopted pursuant to the Clean Air Act and operate all facilities to avoid or minimize air pollution. Every reasonable effort must be made to avoid or minimize dust problems. Where necessary, sprinkling, oiling, or other means of dust control will be required on roads and trails. Burning of waste, timber, or debris must be authorized by the Mining Supervisor. (8.1).

G. Transportation and Utilities Systems

The lessee is granted the right under Section 2 of the lease to construct on the leased lands all roads, powerlines, and additional facilities necessary for the mining, processing, and preparation of products for market. (7.0).

Section 2 of the stipulations requires the lessee to provide corridor plans for roads, pipelines, and utilities. Multi-use corridors must be used to the maximum extent practicable. Existing roads and trails must be used where feasible, as determined by the Mining Supervisor. Roads will be located, built, maintained, and closed to BLM specifications. After roads are constructed, the lessee is required to permit free and unrestricted public access, except in hazardous operational areas. If use of existing roads and trails is restricted, the lessee is required to provide alternate routes as needed. Off-road vehicle use must be consistent with applicable regulations. (7.0).

The design and construction of oil pipelines will follow standards established by the Department of Transportation, and the lessee will meet the safety standards in 49 CFR 110, 49 CFR 192, and 49 CFR 195 of the Department of Transportation. The lessee must also provide for automatic shutoff valves. Detailed pipeline corrosion plans must be submitted to the Mining Supervisor. (7.0, 8.3, 8.11).

Section 2 additionally requires the lessee to design and construct telephone and electric transmission facilities in accordance with the Department of Interior and Department of Agriculture guidelines set forth in "Environmental Criteria for Electric Transmission Systems". (7.0).

A spill contingency plan, required by section 7 of the stipulations, must be submitted to the Mining Supervisor as part of the detailed development plan. The plan must conform to the Federal Water Pollution Control Act and the National Oil and Hazardous Substances Pollution Contingency Plan. The lessee must give immediate notice of any spills of oil or hazardous substances, and he must control, clean up, remove, and dispose of any spills. Oil, petroleum products, industrial chemicals, and similar toxic or volatile materials must be stored in durable containers and located so that accidental spillage will not drain into water courses, lakes, reservoirs, or ground water. The storage areas must be surrounded by impermeable containment structures. (8.2, 8.3).

H. Recreation

Section 2(B) of the stipulations requires the lessee to permit reasonable, free, and unrestricted public access upon roads for all lawful and proper purposes. Off-road vehicle use under section 2(N) must be consistent with applicable regulations. Section 4(B) requires the lessee to submit a habitat management plan which includes access to the public for wildlife hunting and viewing opportunities. The lessee will establish safe access for the public to permanent water impoundments under section 11 (H) of the stipulations. Sections 12 and 15 also pertain indirectly to recreation. (7.0, 8.9, 8.11).

I. Cultural Resources

Before construction or mining, the lessee is required by Section 6 of the stipulations to conduct a thorough and professional investigation of the leased lands for objects of cultural antiquity, historic, prehistoric, or scientific interest. Such objects must not be removed, injured, defaced, or altered by the lessee. The lessee must report the results of these investigations to the Mining Supervisor before commencing construction and mining operations. The lessee shall not remove or destroy any cultural resources discovered during activities on the lease. (*, 2.3, 8.6).

J. Esthetics

Section 12 of the environmental stipulations establishes scenic standards in all designing, clearing, earthmoving, and construction. Contours will be compatible with the natural environment. Natural colors consistent with the local environment will be used in the painting of facilities. Natural openings will be used in construction, and contouring of disturbed areas will simulate natural openings. Esthetic values must be considered in all planning, construction, reclamation, and mining. The design of structures and facilities will blend with the natural landscape. Signs will be rustic in appearance and conform to BLM sign standards. Sections 8, 11, and 14 also pertain indirectly to esthetics. (8.6 which includes 8.7).

K. Health and Safety

Section 12(a) of the lease requires the lessee to conduct all operations on the leased lands so as to prevent injury to life, health, or property. The lessee must also avoid or minimize, and correct hazards to the public health and safety related to his operations on the lease. (8.11).

All buildings and structures, under Section 1 (F) of the stipulations, shall comply with the Uniform Building Code. Compliance with the Federal Metal and Non-metallic Mine Safety Act of 1966 and the Occupation Health and Safety Act of 1970 is required by Section 5 of the stipulations. All blasting operations must conform with Public Law 91-452 and the appropriate regulations in 26 CFR 181. The lessee is required to comply with all applicable Federal, State, and local standards on noise pollution. Noise will be kept at or below levels safe and acceptable for humans. (8.8, 8.11).

L. Socio-Economics

Measures and stipulations to mitigate social and economic impacts from oil shale development are not addressed in the lease or attached environmental stipulations. But the lessees have recognized these potential impacts and are pledged to support and cooperate with regional planning. These efforts are more fully described in part IV of this Decision Document. (14.0)

Section 2 of the lease does provide for employee housing and Section 18 addresses employment practices. The Equal Opportunity clause is presented as Section 19 in this lease. (14.0).

M. Off-Tract

An oil shale lessee or any other party will have to make separate applications for rights-of-way for roads, power transmission lines, telephone lines, and pipelines and for special land use permits and other rights to use land outside the tract for purposes directly or indirectly connected with oil shale development. The environmental stipulations which will be included in such leases, permits, licenses, or other instruments may vary somewhat with the type of permit issued. These stipulations will typically specify seeding mixtures, vegetative clearing methods, erosion control, construction methods, range improvement and wildlife protection, rehabilitation specifications, require archaeological surveys, and painting of structures to minimize visual impacts. (7.0).

N. Lease Administration

Several sections of the lease and attached environmental stipulations address lease administration requirements and not environmental issues. These requirements, as they specifically pertain to the Detailed Development Plan, are summarized in this section.

The payment of bonus bid installments is discussed in Section 5 of the lease. The lessee may credit against the fourth and fifth bonus installments any expenditures directly attributable to operations on the lease for the development of the leased deposits. Expenditures for preparation of the detailed development plan are not attributable to such credit.

Section 7 of the lease requires a royalty on all oil shale extracted by the lessee which is either processed or sold. Royalty for oil shale extracted by mining methods shall be determined on the monthly average of shale oil content of the oil shale, determined by the modified fischer assay method. The royalty for oil shale processed by in situ methods shall be determined by the total gross heat of combustion in BTUs of all oil and gas products, adjusted downward by the total gross heat of combustion of combustible fluids injected as heat carriers. The lessee shall determine accurately the weight or quantity, and quality of all oil shale produced by each method.

The payment of minimum royalties is required under Section 7(e) of the lease. Beginning in the sixth lease year the royalty payments for tract C-a will be based on a minimum annual production rate of 1,130,000 tons of 30 gpt oil shale. The minimum annual production rate will increase by 1,130,000 tons of oil shale per year through the 15th

lease year and then remain at an annual rate of 11,300,000 tons of oil shale through the 20th year, at which time the lease terms may be readjusted.

Upon approval of a detailed development plan, the lessee is required by section 9 of the lease to file an additional bond which shall be conditioned upon the faithful compliance with 30 CFR 231, 43 CFR 23, and the lease and environmental stipulations. The bond shall not be less than $20,000; but represent $2,000 per acre of spent shale disposal sites and mining operations, and $500 per acre for all other portions of the leased lands affected.

Section 10 of the lease requires the lessee to submit a Detailed Development Plan on or before the third anniversary date of the lease. The lessee is required to use all due diligence in the orderly development of the lease and attain production at a rate at least equal to the minimum production rate under Section 7(e) of the lease. The lessee shall obtain the Mining Supervisor's approval of the development plan prior to commencing operations. The Mining Supervisor shall hold public hearings and consider both technical and environmental provisions of the plan prior to approval.

Sections 31 and 32 of the lease address the disposition of surface and underground facilities upon the termination of the lease. Abandonment must also comply with the reclamation requirements of the approved development plan.

Section 1(C) of the environmental stipulations requires the lessee to collect baseline data for at least one full year prior to the submission of the Detailed Development Plan. The environmental monitoring program shall be an integral part of the detailed development plan and a complete compilation of the baseline data collected shall be provided to the Mining Supervisor at the time of the submission of the plan.

IV. Detailed Development Plan Review

A. Detailed Development Plan

Tract C-a lease C-20046 was acquired effective March 1, 1974 by Gulf Oil Corporation and Standard Oil Company (Indiana) for a competitive bonus bid of $210,305,600 payable in five annual installments.

Exploration and environmental baseline data plans were received from the lessees of tract C-a in May of 1974. These plans were revised and approved with conditions, and baseline data collection commenced by the fall of 1974. Two years worth of data was collected by the end of 1976 and the lessee has submitted ten Quarterly Detailed Data Reports, nine Summary Reports, a Final Environmental Baseline Report, and a Social and Economic Impact Statement to the Area Oil Shale Supervisor. For a detailed description of the existing environment of the tract C-a area prior to oil shale development, the environmental baseline data is referenced.

The lessees submitted the required Detailed Development Plan for tract C-a in March, 1976. The proposed plan was to develop the tract by open pit mining with surface retorting of oil shale. Off-tract locations were proposed for processing facilities and overburden and processed shale disposal. This plan was reviewed by the Mining Supervisor and after certain deficiencies were made up by the lessee the plan was determined to be incompliance with the lease.

On July 2, 1976 the lessees of tract C-a applied for a suspension of operations pursuant to Section 39 of the Mineral Leasing Act and Section 22 of the Oil Shale Lease. A one year suspension of operations was granted effective September 1, 1976, by the Area Oil Shale Supervisor for the following reasons:

1) Data from the first year environmental baseline air quality program showed that natural background amounts of non-methane hydrocarbons, ozone, and particulates on occasion exceeded National Ambient Air Quality Standards (NAAQS). This could prevent development of the tract. The Environmental Protection Agency was consulted on this issue prior to granting the suspension and has worked to resolve the issue by administrative interpretive procedures during the period of suspension.

2) Subsequent to the lease sale, the Solicitor determined that the Department did not have the authority to grant off-tract lands for processing or disposal sites. Bills were introduced in Congress to authorize off-tract lands.

On May 25, 1977 the tract C-a lessees submitted a "Revised Detailed Development Plan" changing the method of shale oil production, from open pit mining with surface retorting, to modified in situ methods with surface retorting. This Decision Document only addresses the modified in situ development plan. This plan is not considered a resubmittal as described under Section 10(a) of the lease, but is a revision of the initial submittal. The three volume DDP stands by itself and describes Rio Blanco Oil Shale Project's (RBOSP) proposed operations on and around tract C-a.

On May 25, 1977 the lessees also submitted an application to extend the suspension of operations beyond the September 1, 1977 expiration date. This was requested because the issue of baseline violation of National Ambient Air Quality Standards had not as yet been resolved. This suspension request was denied by the Area Oil Shale Supervisor on August 1, 1977 since the air quality problem is no longer considered by EPA to preclude development. The revised DDP does not require off-tract lands for processing or disposal, thus resolving the second suspension issue.

B. Review Process

The review of a Detailed Development Plan involves a process of submittals, evaluation, meetings, and public hearings which lead to the final decision on approvability of the plan by the Area Oil Shale Mining Supervisor. The procedure includes distribution of the DDP to concerned governmental agencies, industry, special interest groups, and the public; consultation with the Oil Shale Environmental Advisory Panel and the State of Colorado; public hearings; and technical staff review. The findings, needs, and resolution of issues identified by this process are contained in this final Decision Document.

The technical staff review of the plan by the Area Oil Shale Office and comments from other groups is recorded in an Evaluation Document (ED) which is an internal working document that provides the basis for this formal Decision Document. The process for completing the ED assures that the technical staff completes an orderly and thorough review of the Detailed Development Plan in appreciation of the various guidelines, conditions, lease stipulations, and other regulatory requirements that impinge on oil shale development on Federal lands. The document is appreciative of the opinions and technical advice of the Oil Shale Environmental Advisory Panel, the State of Colorado, other governmental agencies, industry, special interest groups, and the public.

The ED consists of three parts: (1) composite outline of the Detailed Development Plan by subject areas; (2) subject reference analysis; and (3) subject compliance and impact evaluation. The final working ED document consists of several loose leaf binders organized by subject areas and an analysis of issues.

Over 200 copies of the Detailed Development Plan for tract C-a, submitted by the lessees to the Area Oil Shale Office on May 25, 1977, were distributed for review on May 27, 1977. Public hearings were held in Denver, Colorado and Rangely, Colorado, on July 26, 1977, and July 28, 1977, respectively. Oil Shale Environmental Advisory Panel (OSEAP) meetings were held in Denver, Colorado and Grand Junction, Colorado on August 2, 1977, and August 25, 1977 respectively to discuss the Detailed Development Plan and provide advice to the Area Oil Shale Supervisor. Final OSEAP advice was submitted to the Area Oil Shale Supervisor by letter on August 29, 1977. The technical staff of the Area Oil Shale Office has completed its review of the DDP by preparing the ED and this Decision Document.

C. Plan Review

The following discussion summarizes the basic development plan contained in the Detailed Development Plan, presents the major issues identified during the review process with respect to technical and environmental aspects

and the manner in which these issues have or will be resolved. The format used is similar to that compiled in the Subject Compliance and Impact Analysis section of the ED which served as the basis for requesting supplementary data from the lessee and/or formulation of draft conditions for approval contained in Part V of this document. The Detailed Development Plan submitted by the lessees of tract C-a should be consulted for specific details (Appendix A). Figures and tables referenced in the following discussion refer to the DDP.

1. Part 1.0, Introduction

a. Basic Plan

The lessee intends to develop tract C-a by modified in situ methods. The proposed plan consists of a rubblized in situ extraction process for recovery of oil from oil shale, a modified sublevel caving method of in situ retort development, on-tract surface retorting, and on-tract disposal of processed shale. The development will consist of two operating phases: 1) Modular Development Phase (September 1977 - November 1986); and 2) Commercial Phase (February 1987 - 2017) at a production rate of 76,000 bbl/day.

The Modular Development Phase (MDP) consists of sequentially developing and operating at least six retorts, from an initial 30'x30'x140' (high) retort, up to 150'x300'x700' (high) retorts. Developing, rubblizing, and burning of each retort will follow, one at a time, after the burn of each preceding retort has been completed. The MDP is planned to extend over a 10 year period. Planned access to the retorts is down vertical shafts to and through horizontal drifts to the retorts. The MDP facilities will be located in the north central part of the tract on the ridge between Corral and Box Elder Gulchs (Figure 1-1-4).

The Commercial Phase devlopment is projected for a 30 year operation utilizing 150'x300'x750' (nominal) retorts. Access to the commercial retorts will be down vertical

shafts to sublevels, then through the sublevels to the retorts. In situ retorting will produce about 57,000 bbl/day. The 20% volume retort material delivered to the surface will be surface retorted during the Commercial Phase in three TOSCO II retorts beginning in 1987. Production from the surface retorts will be approximately 19,000 bbl/day. The commercial plant site is located on the western edge of the tract on the ridge between Corral and Box Elder Gulchs. The processed shale disposal site will be in Rinky Dink Gulch (Figure 1-3-3).

During the Modular Development Phase shale oil will be trucked to an existing refinery or markets. During commercial operations shale oil will be transported by pipeline to Rangely, Colorado, then through an existing AMOCO pipeline to other connecting facilities in the West or Midwest. The by-product sulfur will be trucked to rail facilities near Rifle, Colorado.

Mine dewatering during both phases of development will produce more water than is required for project needs. Excess water will be reinjected. A zero surface discharge concept will be employed throughout the development. Up to 1000 acre-feet/year will be used during the Modular Development Phase and approximately 2200 acre-feet/year during the Commercial Phase.

Purchased power requirements will be about 40 megawatts during MDP operations and 100 megawatts during commercial operations. Low Btu gas from in situ retorting will provide most of the power needs during the Commercial Phase.

Access to the tract will be Rio Blanco County Road 24 from the east and a proposed 25 mile extension of this road from the tract to Rangely on the west. The power transmission line, shale oil pipeline, and Rangely access road will be located, wherever possible, in a common corridor.

The proposed development will require a peak work force of 2500 during 1985 with a permanent personnel level of 2075 in 1987, for a 76,000 bbl/day operation.

Plans for environmental protection are discussed in Part 8.0. Rehabilitation, including revegetation, will be a continuing program. Detailed abandonment plans and procedures will be prepared prior to abandonment activities.

b. Issues

The "Revised Detailed Development Plan" (Appendix A) is a complete document which describes RBOSP's proposed operations. No major issues with respect to the overall scope of the proposed plan have been identified during the review process, however the review process did identify some specific concerns. These specific issues are identified in

the specific review sections which follow in this Decision Document. Because all technical questions and general concerns were clarified, there are but few issues which remain.

The major issues which are discussed in the following sections will be those which required submittal of supplemental material (Appendix B) from the lessees, are of major public concern, or require some condition of approval to insure compliance with the lease and protection of the environment. The supplemental material, dated September 2, 1977, is to be attached and considered a part of the "Revised Detailed Development Plan". Special interest groups have requested that a new or supplemental Environmental Impact Statement be prepared prior to approval of the DDP. These groups claim that the technology to be used was not covered in the original statement in August 1973.

c. Resolution of Issues

The Final Environmental Impact Statement for the prototype Oil Shale Leasing Program discussed conventional underground mining and surface retorting, conventional open pit mining and surface retorting, and in situ processing. The use of

conventional mining techniques to create the permeability required for in situ shale oil production was also presented. An EIS at this time would draw primarily on information generated by the prototype program to date. This information has all been made public and has been subject to public debate through OSEAP, public hearings, and interagency meetings. A separate review of the DDP was completed and shows that no new impacts over those presented in the EIS are anticipated, and the degree of impacts are consistent with those of the EIS.

d. Recommendations

It is recommended that the overall scope of the DPP as presented in the "Introduction and Executive Summary", of the DDP be approved.

A new or supplemental Environmental Impact Statement related to this DDP approval is not needed.

2. Part 2.0, Description of Project Area

a. Basic Plan

Description of the project area is presented at length in Volume III, Section 7 of the DDP, two complete years of environmental baseline data on public file at the Area Oil Shale Office, and in the two volume Final Environmental Baseline Report (May 1977).

The tract is situated in the western part of Piceance Creek basin as part of the Roan Plateau. The tract is dominated by northeast trending ridges and valleys with an average elevation difference of about 300 feet. Elevations range from about 6600 feet in Corral Gulch near the northeast corner of the tract to slightly more than 7400 feet on Airplane Ridge near the southwest corner of the tract.

Tract C-a is drained by Corral and Box Elder Gulches which flow into Yellow Creek and eventually into the White River. The 1975 water year runoff for Corral Gulch and Yellow Creek was 626.2 acre-feet and 1158.7 acre-feet respectively. Three distinct groundwater systems occur in the area: surface alluvial aquifer, the upper bedrock artesian aquifer, and the lower bedrock artesian aquifer.

Oil shale, of principal economic interest, is found essentially within the Parachute Creek member of the Green River Formation. An oil shale zonation was established within tract C-a which resulted in the delineation of 19

alternating rich and lean oil shale zones (Figure 7-2-5). Overburden thickness to the A-groove horizon ranges from about 60 to 875 feet, with a tract average of about 480 feet. Dawsonite occurs in a stratigraphic interval from the upper part of the R-2 zone through the lower part of the R-5 zone. The minor occurrences of nahcolite within the oil shale interval have little commercial value.

The long range climate of the area surrounding the tract is similar to semi-arid steppe regions. The annual precipitation is 10 to 12 inches, but is strongly dependent on local topography and elevation. There is a high frequency of clear, sunny days, with high winds and large diurnal temperature changes. Ozone, hydrocarbons, and particulates occasionally exceed Federal and State ambient air quality standards. Visibility over the tract is exceptionally good. Noise measurements in the area represent fairly low pristine levels.

The majority of the tract C-a area is occupied by pinyon-juniper and sagebrush vegetation types (68% of area). The pinyon-juniper type represents one of the most important vegetation types in the tract C-a ecosystem because it provides a critical food supply and source of shelter for animals inhabiting the area during the winter, as well as providing nesting sites and cover for species inhabiting the type during the summer. Forage production estimates ranged

from 268 lbs/acre for sagebrush to 100 lbs/acre for pinyon-juniper. Riparian vegetation types are uncommon (< 1%) on tract and are restricted to small springs in open, alluvial bottomlands.

Big game species in the area include mule deer and elk. Mule deer use the tract mainly as transitional and upper winter range. Thirty species of small and medium-sized mammals have been trapped in the vicinity of the tract, with the least chipmunk and deer mouse being the most abundant. The coyote, long-tailed weasel, and short tailed weasel are the most common mammalian predators. During baseline studies, 139 avian species were observed. Several bands of feral horses range over the area. Three BLM grazing allotments have been set up in the vicinty of the tract, with an estimated tract carrying capacity of 600 AUM's.

The endangered peregrine falcon has been observed once in the area during an aerial census. The lack of suitable cliffs for nesting sites makes it highly unlikely any peregrine falcons nest in the Piceance Basin. The one observation was probably a migrant as no subsequent peregrines were observed.

Approximately 30 greater sandhill cranes have been observed in the area. All sightings were made immediately preceding the passage of a storm front with high winds. The

storm fronts probably forced the birds to land and wait out the storm. The Colorado Wildlife Commission has designated cranes that nest in Colorado an endangered population. The presence of a juvenile whooping crane with the sandhill cranes, makes it highly probable they were migrating from the Gray's Lake Refuge in Idaho. The whooping crane eggs were placed in sandhill crane nests at Gray's Lake. The Gray's Lake population is not considered endangered.

A rare milkvetch was observed on shale outcropping northwest of the tract. No official list of threatened or endangered plants have been published by the U. S. Fish & Wildlife Service that includes this milkvetch.

Aquatic habitat is limited mostly to ephemeral streams and small springs and seeps. No fishery habitat occurs on tract. The nearest fish populations are 20 miles to the north in the White River.

Cultural resource artifacts recovered from the tract and vicinity indicate four periods of occupation: Archaic, Fremont, Ute, and 19th Century Anglo. Two archaeological sites in the area (one on-tract) were considered to be of National Historic Register significance. The required 106/2b statement is being prepared by BLM.

b. Issues

No major issues have been identified in this section of the review. The DDP provides a

summary of information from the 2 year baseline program. The detailed data has been submitted in the "Final Environmental Baseline Report for Tract C-a and Vicinity".

c. Resolution of Issues

None required.

d. Recommendation

It is recommended that this portion of Section 7 of the DDP be approved.

3. Part 3.0, Overall Project Schedule

a. Basic Plan (Figures 1-1-2 and 2-7-1)

Construction	
Power transmission line	Sept. 1977-March 1978
Access roads	May 1978-March 1979
Communications	May-August 1982
Processing facilities	March 1982-Jan. 1987
Product pipeline	May-November 1985

Modular Development Phase (MDP)	
Shaft sinking	Sept. 1977-early 1979
Mine development (levels)	1979-1985
Rubblize retort 1	Sept. 1979
Operational	October 1979-Nov. 1986

Commercial Phase	
Service shaft	July 1982-late 1984
Production shaft	late 1982-early 1984
Ventilation exhaust shaft	early 1984-early 1986
Ventilation intake shaft	late 1984-late 1986
Gas exhaust shaft	early 1986-early 1987
Combustion air shaft	late 1986-early 1987
External mine field development	July 1982-Jan. 1985
Field No. 1 development	early 1984-early 1987
Burn initial retort (Field No. 1)	Feb. 1987
Operational	Feb. 1987-Life of Tract

Manpower (Figure 1-1-5)	
Peak employment (76,000 bbl/day)	2500 in 1985
Permanent work force (76,000 bbl/day)	2075 in 1987

Disturbance (all types) Table 1-6-3

Year	Acres
1978-1980	211
1980-1985	564
1985-1990	494
1990-2000	250
2000-2010	240
2010-2016	---
	1759 Total

Reclamation (all areas) Table 1-6-3

Year	Acres
1978-1980	92
1980-1985	118
1985-1990	304
1990-2000	235
2000-2010	430
2010-2016	215
	1454 Total

b. Issues

The schedule of land to be disturbed and revegetated (Table 1-6-3) indicates that a significant number of acres of the processed shale disposal pile remains unreclaimed for a number of years.

c. Resolution of Issues

The resolution of this issue is addressed as part of the Development Rock and Processed Shale Disposal discussion in Section 6 of this Decision Document.

d. Recommendation

Approval of the overall project schedule is recommended, in consideration of the resolution of the above issue and the condition of approval contained in Section 6 of this Decision Document.

4. Part 4.0, Mining

a. Basic Plan

Mining will include access to the Modified In Situ (MIS) retorts, rubblization of the retorts, and development of passageways for incoming retort products (gas, oil and water) to the surface.

Modular Development Phase

Mine layout of the Modular Development Phase (MDP) includes a shaft and surface protection pillar containing a production-service shaft, exhaust ventilation shaft, a series of 5 retorts which increase in size, and several commercial size retorts. The shaft pillar will be located in the south-central part of the Modified In Situ (MIS) area (Figure 2-6-1). It will extend at a 1:1 draw angle from the surface facilities to the sides of the commercial retort fields.

The service-production shaft will be a 15 feet in diameter, upreamed, concrete lined 1185 feet deep shaft containing a ladderway and service lines (compressed air, drinking and fire water line, pump mains and power and communication cables). The ventilation shaft will be a seven feet in diameter, drilled, steel lined shaft which is also planned to be 1185 feet deep. A single 8-foot diameter shaft bored from the surface will connect to the B-level network of tunnels which will be used to distribute combustion air to retorts 5, 6 and up (Figure 2-6-7).

Ten sublevels (A through J) will be used to develop and monitor the Modular Development Phase retorts (Figure 2-6-3). The main entrance drift on each sublevel, the main haulage drifts (J level) and the ramps will be 15 feet wide by 12 feet high. All other drifts will be 13 feet wide by 10 feet high. Access for development of the commercial retorts will be through the sublevels (B through J).

Retorts are planned to be developed in increasing size from 30 feet by 30 feet by 140 feet high (retorts 1 and 2), to 50 feet wide by 100 feet long by 140 feet high (retorts 3 and 4), to 100 feet wide by 150 feet long by 400 feet high (retort 5). The remaining retorts will be of commercial size (150 feet wide by 300 feet long by 700 feet high).

The first four retorts will be significantly smaller than those proposed for commercial operation, and therefore they are planned to be rubblized by a different system then the commercial size retorts.

The upper, intermediate, and lower level drifts and crosscuts will be excavated first to provide drilling locations. Bored raise(s) will then be drilled through the full retort height to provide a free face for fragmentation. The oil shale will be blasted in sections using vertical holes and Ammonium Nitrate and Fuel Oil (ANFO) explosives. Broken shale is planned to be withdrawn by load haul dump equipment (LHD) to attain the desired void volume. Initially, all development rock will be hoisted up the MDP service

production shaft. Larger size retorts will allow rubblizing to be achieved by the sublevel caving method planned for the Commercial Phase retorts. Average ore production will be about 500 tons per day for development of retorts 1 thru 5, and about 3,000 tons per day for retorts 6 and up. Up to 12,000 tons per day of ore will be rubblized within the retorts during the MDP.

During the development and burning of retorts in the MDP, ventilation intake air to the mine will enter through the service-production shaft and exhaust to the atmosphere through the ventilation shaft. The ventilation shaft will be equipped at the surface with a main fan installation with a capacity of 200,000 CFM (cubic feet per minute). Supplemental ventilation will be provided by auxiliary fans and ducting. Twin drifts will be constructed to all major areas of operation. The main access drift will be used for air intake and the parallel return drift will be used exclusively to remove exhaust air and mine water drainage (Figure 2-6-9a). Fresh air for levels not directly connected to the service-production shaft will be supplied through the access ramps. The combustion air for the retorts will be provided by bore holes from the surface and is separate from the mine ventilation system.

Commercial Phase

Mine layout of the Commercial Phase includes six

shafts located west of the MDP shafts within the shaft pillar. The shafts will be identified by function as service, production, intake ventilation, exhaust ventilation, retort off-gas and combustion air. Four separate retort fields are located outside the surface protection pillar (Figure 2-6-2). The retort fields include No. 1 north of the shaft pillar, No. 2 northeast of the pillar, No. 3 east of the pillar, and No. 4 north-west of the pillar. These fields are planned to be developed in numerical sequence. The commercial phase retorts are planned to be developed from eight mining levels. Four of the levels will be connected to the service shaft, and ramps connect to the remaining levels (Figures 2-6-3 and 2-6-10).

Commercial size retorts within the four fields are planned to be 150 feet wide by 300 feet long and average 750 feet high.

Pillars separating the retorts vary in thickness, which is dependant on the depth of overburden. Pillar sizes vary between fields, but are uniform within a particular field. Pillars will be designed to limit the lateral propagation of retort-combustion, to confine the retort gases to the rubblized room, and to support the overburden.

The method of rubblizing the commercial retorts will resemble sublevel caving. Rubblizing will progress in the commercial retorts starting at the upper most sublevels

from which blastholes will be drilled parallel to an open panel at one end of the retort. Blasting will progress away from the panel. Rubblizing can be initiated from successively lower sublevels after it has advanced sufficiently on the level above (Figure 2-6-15). About 134,000 tons per day of ore will be rubblized in the retorts during the commercial phase.

In order to achieve the desired void volume, a portion of the mined rock must be removed from the development and production faces. Load haul dump equipment will be used to move the mined rock to the ore passes which have loading chutes on the haulage level (J level). Diesel trucks will haul the mined rock from the loading chutes to the crusher station where the rock will be crushed and hoisted to the surface (Figure 2-6-15). Primary crushed ore will be transferred from the mine headframe rock bin by overland conveyors to the primary ore stockpile. Average ore production will be about 40,000 tons per day for development of the in situ retorts.

During normal Commercial Phase operations, 4,000,000 CFM (cubic feet per minute) of ventilation air will be drawn through mine workings by a battery of six horizontal two-stage axial flow fans. A single 8-foot diameter shaft will be bored from the surface and connected to the B level network of tunnels which distribute combustion air to the retorts.

b. Issues

(i) Final engineering designs for mining operations in the Modular Development Phase were not contained in the DDP.

(ii) Final engineering designs for mining operations in the Commercial Phase were not contained in the DDP.

(iii) Change of shaft sinking methods from that presented in the DDP were being considered by the lessee.

(iv) Change of size and geometry for Modular Development Phase retorts was being considered by lessee.

c. Resolution of Issues

(i) The lessee will be required by a specific condition of approval to submit final design plans to the Mining Supervisor for his review.

(ii) The lessee will be required by a specific condition of approval to submit final design plans to the Mining Supervisor for his review and approval.

(iii) In the supplemental material (Appendix B), the lessee provided a change from the shaft sinking method described in the DDP. The Service and Production shaft will now be sunk

conventionally to a final depth of 950 feet. The Ventilation Shaft is planned to be upreamed in two lifts from total depth to the C level and from the C level to the surface. This sinking method change has no adverse technical or environmental effects. A positive effect of the change is that the Modular Development Phase mining operations will now be limited to the upper aquifer.

(iv) In the supplemental material (Appendix B), the lessee provided a change to the Modular Development Phase retort sizes and arrangement from that described in the DDP. Retort No. 1 remains the same, retorts 2 and 3 are replaced by retorts 3 and 3A which are 50' X 100' X 140' high, and retorts 4 and 5 are replaced by retorts 5 and 5A which are 100'x100'x400' high. All five retorts are in line whereas retort 5 was not in line with the first 4 retorts in the DDP. The remaining Modular Development Phase retorts, 6 and up, will be reduced to a height of 400 feet. They will be developed and burned during the Commercial Phase construction period. This change was necessary because capacities of optimum size

Modular Development Phase equipment limits the maximum retort size and production rate. The change in the first five retorts allows the Commercial Phase rubblization method to be implemented earlier in the Modular Development Phase. Also, this change allows greater stressing of the pillars between the initial retorts due to the larger size of the retorts involved. The evaluation of the Commercial Phase, 750 foot high retorts will be based upon the results of modeling of the fifth retort as stated in the DDP. The lessee does not anticipate this change will affect the planned schedule and rates for the Commercial Phase.

d. Recommendation

That Section 2 of the DDP as modified by the supplemental material be approved subject to the conditions of approval below.

e. Conditions of approval

(i) Prior to commencing any operations under the Modular Development Phase of the Detailed Development Plan (DDP), the lessee shall submit final design plans, as requested by the Mining Supervisor, for his review, as to

adherence to the DDP, to the terms of the Oil Shale Lease, and to the requirements of 30 CFR Part 231 and 43 CFR Part 23 or any subsequent applicable revisions there of.

(ii) Prior to commencing construction of Commercial Phase facilities, the lessee shall submit plans, as required by the Mining Supervisor, for his review and approval as to adherence to the plan of action contained in the DDP, to the terms of the Oil Shale Lease, and to the requirements of 30 CFR Part 231 and 43 CFR Part 23 or any subsequent applicable revisions there of.

5. Part 5.0, Processing

a. Basic Plan

Modular Development Phase

The Modular Development Phase involves construction and operation of a series of modified in situ retorts of progressively increasing size as previously described. The MDP program may culminate in the operation of commercial-size MIS retorts. Production during the MDP will vary because of the sequential development of retorts. Production will be sufficiently small that oil produced during the MDP will be shipped from tract C-a by truck rather than transported by pipeline.

A flow diagram of the Modular Development Phase processing facility is shown in Figure 3-2-1. As shown, air is compressed and piped to the retort together with steam. Products from the retort flow to an underground separator where gas is separated from oil and water. The gas flows to a central collection point above ground, through a wet gas scrubber and then to a thermal oxidizer where the combustible components of the gas are burned. The thermal oxidizer is equipped with a flue gas scrubbing system to control atmospheric emissions.

Oil and water streams from the underground separator are pumped to above ground settlers. Separated oil is sent to a tank for storage prior to shipment by truck from the

tract. Water collected from the settlers will be sent to the thermal oxidizer.

Commercial Phase Processing Operations

The Commercial Phase processing facility involves retorting oil shale to produce approximately 76,000 BPSD (barrels per stream day) of pipeline quality shale oil. The Commercial Phase processing operations shown in Figure 3-3-1 will involve a combination of MIS and above ground retorting (in TOSCO II retorts) of oil shale. The Fischer Assay shows an average grade of 23 gallons per ton (GPT). The Commercial Phase plan is calculated to achieve 82% of Fischer Assay oil recovery based on the total rock mined and rubblized. Approximately 51% will be liquid oil drained from the bottom of the in situ retorts. Twenty percent will be oil recovered from surface retorting. Finally, 11% will be oil condensed under pressure from the off-gas stream.

MIS retoring is accomplished by heating rubblized shale as previously described - oil, water and low BTU gas flow from the retorts to the oil-gas recovery plant. The oil is then fractionated to produce naphtha and heavy oil fractions (Figure 3-3-1). The gas will be purified of sulfur compounds and used as fuel to produce electric power through a gas turbine.

Modified in situ retorting rates of up to 14 feet per day are anticipated. Three retorts would be operating at maximum rate, a fourth being started up and a fifth retort being shut down. Anticipated production of liquid oil from the retort product collection system is 47,000 BPSD. An additional 10,000 BPSD will be recovered in the gas purification section giving a total MIS production rate of 57,000 BPSD.

Preparation of MIS retorts requires removal from the ground of approximately 20% of the rubblized shale. This shale is brought to the surface and retorted in a TOSCO II plant. The TOSCO oil and high BTU gas will be sent to the raw oil recovery plant where gas, naphtha and heavy oil streams will be separated. Gas will be sent to the high BTU gas plant where a fuel gas will be prepared for purification in the sulfur recovery plant.

The TOSCO II process is a proprietary process. A flow diagram of the process is shown in Figure 3-3-4. The TOSCO II process yields an additonal 19,000 BPSD oil to the inventory.

Naphtha and heavy oil from surface and underground retorting will be sent to the oil upgrading and blending plant (Figure 3-3-1). Heavy oil streams are treated as required with a flow-improving chemical and then blended with naphtha and C_4 fractions to produce an oil product which can be pipelined from tract C-a.

b. Issues

(i) Sulfur concentrations expected from various processes, and fuel gases in the Modular Development Phase and Commercial Phase were not clearly presented in terms of a sulfur balance in the DDP.

(ii) Final engineering designs for processing operations in the Modular Development Phase were not contained in the DDP.

(iii) Final engineering designs for processing operations in the Commercial Phase were not contained in the DDP.

c. Resolution of Issues

(i) In the supplemental material (Appendix B), the lessee provided a sulfur balance showing sulfur flows in lbs./hr. for the Modular Development and Commercial Phases of the project. The flow diagrams provided all expected inputs of sulfur from both raw shale and fuel gas sources. The expected emission and product sulfur flow rates were also included.

(ii) The lessee will be required by a specific condition of approval to submit final design plans to the Mining Supervisor for his review.

Resolution of a similar issue in Section 4 of this Decision Document results in a condition of approval which resolves this issue.

(iii) The lessee will be required by a specific condition of approval to submit final design plans to the Mining Supervisor for his review and approval. Resolution of a similar issue in Section 4 of this Decision Document results in a condition of approval which resolves this issue.

d. Recommendations

That Section 3 of the DDP and the associated supplemental material be approved subject to the conditions of approval contained in Section 4 of this Decision Document.

6. Part 6.0, Development Rock and Processed Shale Disposal

a. Basic Plan

Material Handling

Prior to major excavation, topsoil will be stripped and stored from sites selected for raw and processed shale disposal. Plant construction, access roads, pipeline, and water control structures, will also disturb the land. Table 6-8-1 shows the expected times of disturbance and subsequent reclamation.

Initially, run of mine (ROM) material (24" and less in size), produced from the Modular Development Phase will be moved by trucks from the shaft to disposal piles northeast of the mine service area (Figure 4-2-1). This raw shale ore, eventually will cover 65 acres at the top of Corral Gulch. Slopes will be dressed to a final 4:1. The ore will then be covered with soil previously stock piled and revegetated.

Commercial development will produce approximately 27 million tons of raw ore. This shale will be crushed to a maximum eight inch size, then transfered to disposal piles on the southwest corner of the tract by conveyor and truck (Figure 4-2-1). Part of this material will be reclaimed with the soil from the 260 acre site. The rest of the soil will be used for the artificial soil profile on the processed shale.

During the commercial development stage, further crushed ore will be moved from shafts by conveyor to Tosco II retorts. This will eventually produce 310 million cubic yards of processed shale, which will be transported from the retorts by overland belt conveyor to bottom dump trucks. The trucks will haul the material to Rinky Dink Gulch in the southeast corner of the tract, where the processed shale will be distributed and compacted by scrappers, haulage equipment and segmented foot compacters. The processed shale pile will ultimately cover 880 acres. Should any process shale be used to fill the modified in situ retorts, the size and height of the pile will be reduced. (See Section 19, this review).

Eventually the soil will be covered by three to five feet of crushed raw shale and one half to one foot of soil to produce an artificial soil profile, favorable to planting (Figure 6-8-1). Slopes on the pile will be dressed at 4:1.

Revegetation

The results from the experimental plantings initiated on tract in 1975 and 1976 will be used to demonstrate the suitability of present technology on tract C-a. The following items are currently being investigated through the experiments:

- best selection of seed
- effect and scheduling of mulching & fertilizers
- growth and survival of mature shrubs on artificial soil profile
- effect of aspect
- growth without irrigation
- effect of artificial soil profile on capillary, salt movement into topsoil

Additional revegetation information is provided in Section 18 of this Decision Document.

b. Issues

(i) Further explanation is needed regarding the profile and elevation of the processed shale disposal pile during progressive stages of formation.

(ii) The feasibility of backfilling the spent retorts with processed shale should be evaluated for potential reduction of the volume of this material to be disposed of on the surface.

(iii) The processed shale disposal pile reclamation schedule was presented as a issue in Section 3 of this Decision Document.

c. Resolution of Issues

(i) In the supplemental material (Appendix B), the lessee discusses the sequence of development

of the processed shale pile and presents several sketches showing sequential pile development. The final height, contours, and relationship to the surrounding terrain for the final pile is also presented. Review of this submittal indicated that the sequential pile construction results in a delay before revegetation procedures could be implemented. (See Section 3 of this Decision Document and issue iii above). The lessee will be required by a specific condition of approval to evaluate the disposal plan.

(ii) The lessee will be required by a specific condition of approval to continue to evaluate underground disposal of processed shale.

(iii) The lessee will be required by a specific condition of approval to optimize the reclamation schedule.

d. Recommendation

It is recommened that Section 4 of the DDP as modified by the supplemental material be approved subject to the condition of approval below.

e. Condition of Approval

Prior to Commercial Phase operations, surface

processed shale disposal plans shall be evaluated in consideration of optimizing the revegetation schedule with pile development. The lessee shall continue to evaluate the alternative for underground disposal of processed shale.

7. Part 7.0, Access and Service

a. Basic Plan

Roads

Ryan Gulch Road (Rio Blanco County Road 24) will serve Tract C-a as a primary access during the Modular Development Phase. It extends westward to the tract from Piceance Creek Road. The road is currently unimproved and will need to be paved. An extension of County Road 24, west and north of the Tract, would cut 43 miles off the driving distance to Rangely and act as the major access during commercial development.

Maximum vertical grades of on-tract service, haul, and mine access roads will range from 8-10%. These roads will be designed for safe stopping at a speed of 30 to 50 mph. Access to the processing facility and the mine will be controlled by security gates located west of the administration building and east of the mine. A gate will be placed across the Corral Gulch road at the eastern tract boundary.

Pipeline

Since Amoco already has pipeline facilities southwest of Rangely, commercial shale oil will be transported there by means of a 10-inch diameter, 26 mile long pipeline. This line will follow the proposed Rangely access road most of the way. Three and one half miles south of Rangely, the pipeline will swing west along established utility lines and

curve northward to the Amoco facilities (Figure 5-1-1). It will comply with all Federal, State, and local regulations.

Electric pumps will be installed to handle the maximum commercial run of 76,000 BPSD. Safety measures along the pipeline will include:

- Relief valves and high pressure shut-down devices.
- Tar enamel, fiberglass, and asbestos coatings on the pipe to comply with the National Association for Corrosion Engineers.
- Leak monitoring through pressure flow instrumentation.
- Internal corrosion rates and monitoring using coupons (small pipe samples) and analyzing them every six months.

Fifty feet of right-of-way will be needed where the pipeline runs away from the access road. The line will be placed in a trench 24 inches wide through soil and 28 inches wide through rock. It will be covered by 36 inches of soil.

Fuel Supply

Table 5-7-1 gives the estimated fuel needs. Fuel will be stored on skid-mounted tanks at the site and transferred to underground day tanks through a transfer pump and buried pipeline.

Electric Power

During the Modular Development Phase (MDP) up to

40 MW of power will need to be imported. 325 MW will be needed in the commerical operation, 100 MW of which will be imported.

Diesel generators will be used while power lines to the tract are being constructed by Moon Lake Electric Association. 225 MW of power will be generated on site from low BTU MIS off gas during the commercial stage.

Imported power will reach the site through 22 miles of 230 KV lines which will run from an existing line eight miles east of Rangely to Tract C-a. All power lines within the tract will be designed in accordance with R.E.A. standard V-C-1.

Diesel engine generators will be provided for standby power in the event of a power failure.

Water Supply

Process water for the boiler and thermal oxidizer during MDP will be drawn from the dewatering system (mine seepage) and surface runoff. Water from upper aquifer wells will be treated and supply the potable water requirements. The mine service retention pond will contain 500,000 gallons for fire protection purposes in the MDP. Runoff from the mine service facilities will be recycled and used in process and dust control.

During the Commercial Phase, greater quantities of process water will be required from the dewatering system

and surface drainage sources. Greater quantities of potable water from upper aquifer wells will be stored and distributed in additional lines. A 5,000,000 gallon tank will be constructed at a high enough elevation to provide fire protection for all areas except the TOSCO retorts. Two 1,000 G.P.M. pumps will provide similar protection for the TOSCO retorts. Dust control water on the processed shale pile will come from site runoff water stored in Rinky Dink Reservoir.

Impoundments/Diversion

All impoundments within the site will be designed to withstand 100 year floods. Lined ditches will be built around the process shale pile to channel any runoff to Rinky Dink Reservoir. A drainage diversion system will transfer any upstream flow from Rinky Dink Gulch into the adjacent Box Elder Gulch.

Communications

Phone service will be provided to the tract from Rangely. A radio telephone system will be installed during MDP until service lines can be installed.

Two way F.M. radios will be used during commercial operations to direct haulage, reclamation, maintenance and overall surface supervision.

Buildings

The only permanent support building during the MDP will house the diesel engine generators. All other support

facilities will be temporary buildings and trailers which will be removed when the commercial phase buildings are constructed.

The support buildings to be constructed during commercial operations are as follows:

Mine Service Area: change house and mine office, mine safety and rescue building, maintenance shop and warehouse, flammable liquids storage.

Process Plant Area: administration and laboratory building, maintenance shop and warehouse, change house and office, emergency control center, flammable liquids storage.

Processed Shale Disposal Area: maintenance shop, change house and warehouse, equipment wash and tire shop, flammable liquids storage.

Miscellaneous: gate guard houses, pump enclosures.

Explosives Storage

A temporary explosives storage site will be selected during the MDP. Commercial requirements are listed in Table 5-9-1 based on a ten day supply. Storage during this phase will be in Box Elder Gulch (Figure 5-1-2) where steep canyon walls naturally barricade the site. Seven ammonium nitrate storage silos will also be placed on tract near the main road and mine production shaft.

b. Issues

(i) Plans for providing alternate access and the types of road surfacing meterials in accord with Sections 2(M) and 9(F) of the environmental stipulations are not complete in the DDP.

(ii) The size of water retention facilities and the lining of ponds, reservoirs, and diversion ditches is not complete in the DDP.

(iii) Major design features for roads, pipelines, and utilities are not presented in the DDP.

c. Resolution of Issues

(i) In the supplemental material (Appendix B), the lessee discusses the sequential development of the tract, access and alternate road requirements, and road closures necessary for public health and safety. Several sketches are provided which show sequential road plans. On-tract service, haul, and mine access roads will have crushed rock surfacing.

(ii) The lessee presents in the supplemental material (Appendix B) the size of all water retention facilities. Water facilities are planned to be lined with suitable materials.

(iii) The resolution of similar issues in Section 4 of this Decision Document results in conditions of approval which resolve this issue.

d. Recommendation

Approval of Section 5 of the DDP as modified by the supplemental material is recommended in consideration of the above issue and the conditions of approval contained in Section 4 of this Decision Document.

8. Part 7.1, Off-Tract Corridors

a. Basic Plan

A single transportation and utility corridor from Ryan Gulch and Piceance Creek to Rangely will serve the needs of RBOSP in both the MDP and Commercial Phase (Figure 5-1-1). The Bureau of Land Mangement must approve the exact routes for facilities with respect to this corridor.

The eastern part of the corridor contains the access road. From Tract C-a to the Rangely area, the corridor contains the access road, telephone cable, product pipeline, and the power transmission lines. The power line leaves Spring Creek and follows Calamity Ridge to Moon Lake Electric Association's existing transmission line about 8 miles northeast of Rangely. The product pipeline leaves Gillam Draw about 3 1/2 miles southeast of Rangely and continues westward to the Rangely pump station.

b. Issues

Public review and hearings expressed support for the construction of the Rangely access road for providing access to Rangely which has actively planned for community growth (see Section 26 of this Decision Document). Concern is addressed for the responsibility for funding and construction of this access road.

c. Resolution of Issues

It is beyond the scope of the Mining Supervisor's authority to approve off-tract facilities. All considerations for the Rangely access road have not been resolved and negotiations will take place with BLM during the decision process. The ultimate approval lies with BLM and State and local governments.

d. Recommendation

It is recommended that this portion of Section 5 of DDP be approved.

9. Part 8.0, Environmental Control Plans

a. Basic Plan

The lessees plan is to construct and operate an environmentally acceptable oil shale operation in compliance with the lease provisions and all applicable Federal, State, and local environmental protection and pollution control regulations. The protection procedures described in the DDP cover the following topics:

Health and Safety
Fire Prevention and Control
Noise Control
Air Quality Control
Water Quality Control
Oil and Hazardous Materials Control
Land Rehabilitation and Erosion Control
Solid Waste Control
Aesthetics
Fish and Wildlife Management
Protection of Objects of Historic and Scientific Interest
Subsidence Control
Abandonment

These control plans are specifically addressed in Sections 10 to 21 of this Decision Document.

b. Issues

(i) The environmental control plans should utilize the best available control technology.

(ii) The environmental control plans should be reviewed and revised prior to commercial development.

(iii) Final engineering designs for the environmental control plans in both the Modular Development and Commercial Phases of development were not contained in the DDP.

c. Resolution of Issues

(i) The lessee will be required by a specific condition of approval to utilize best available control technology.

(ii) The lessee has planned on evaluating and refining the environmental control plans prior to committing resources to the Commercial Phase. A condition of approval will make it mandatory that these control plans be supplemented with specific details prior to scale up to commercial operations.

(iii) The lessee will be required by a specific condition of approval to submit final design plans to the Mining Supervisor. Resolution of similar issues in Section 4 of this Decision Document results in conditions of approval which resolve this issue.

d. Recommendation

It is recommended that all environmental control plans, contained in Section 6 of the DDP and summarized in the following review sections, be approved subject to the

conditions of approval contained in Section 4 of this Decision Document, subject to the condition of approval below, and subject to specific conditions of approval cited in the following sections.

e. Condition of Approval

The lessee will incorporate the best available environmental control technology in all phases of the Modular and Commercial development. Environmental control plans shall be reviewed and revised, as needed, prior to implementation of the Commercial Phase development.

10. Part 8.1, Air Pollution Control

a. Basic Plan

Modeling was done for the proposed development operations of Modified In Situ recovery of shale oil, on-tract surface retorting of materials brought to the surface, on-tract disposal of processed shale and waste materials and on-tract support facilities. The critical emissions are sulfur dioxide, oxides of nitrogen, particulates, total hydrocarbons, and carbon monoxide. These MDP and Commercial Phase emissions and their sources are listed in the following tables which were compiled from data presented in the Revised DDP. The Modular Development Phase modeling predicted concentration less than Colorado Category I increments for all concentrations except the annual average of SO_2. All Federal and state emission standards will be met.

The air quality will be affected by the addition of sulfur dioxide, nitrogen oxides, particulates, hydrocarbons and carbon monoxide but due to the small scale of development activities during the Modular Development Phase, there will be little change in the existing quality of air in the Piceance Creek basin.

Best available control technology will be used to control fugitive dust, to minimize particulates and gaseous emissions and to maintain air pollutants at levels below the state and federal standards.

MDP EMISSIONS
lb/hr

	SO_2	NO_x	Particulates	Hydrocarbons	CO
Steam boiler	62[1]	62[2]	33[4]	5.2[4]	--
Incinerator	371[1]	831[2]	42[4]	2.3[4]	--
Tank Vapor loses	--	--	--	2.4[6]	--
Mine ventilation	--	26[3]	1.6[3]	--	33[3]
ROM Development Ore Disposal	--	--	14.3[5]	--	--
	433	919	90.9	9.9	33

[1] Assumes total conversion of sulfur in fuel to SO_2.

[2] Calculated by Foster Wheeler based on gas composition, flame temperature, size of flame envelope.

[3] Based on Colorado Mining Regulations

[4] Based on AP-42.

[5] Based on AP-42 where possible, other information used as necessary.

[6] Based on AP-42, Supplement No. 1, July 1973.

COMMERCIAL PHASE EMISSIONS

lb/hr

	SO_2	NO_x	Particulates	Hydrocarbons	CO
Tosco preheat	42[1]	429[2]	120[9]	147[7]	--
Tosco steam superheater	0.6[1]	21[2]	21[4]	--	--
Tosco shale Moisturizing	--	--	30[4]	--	--
High BTU gas plant	0.3[1]	8[2]	0.3[5]	0.6[11]	--
Theraml Oxidizer	31[1]	50[2]	0.7[5]	0.7[11]	--
Power generation	384[1]	1860[2]	320[8]	20[11]	--
Tank vapor losses	--	--	--	6[10]	--
Mine ventilation	--	530[3]	31[3]	--	658[3]
Feedstock preparation and materials handling	--	--	42[6]	--	--
Processed shale deposit	--	--	11[6]	--	--
Total	457.9	2898	576	174.3	658

[1] Assumes total conversion of sulfur in fuel to SO_2.

[2] Calculated by Foster Wheeler using gas composition, flame temperature, size of flame envelope.

[3] Based on Colorado Mining Regulations

[4] Based on information received from scrubber vendors.

[5] Based on AP-42.

[6] Based on AP-42 where possible, other information used as necessary.

[7] Based on Tosco information.

[8] United Technologies Bulletin, "Turbo Power Tech Talk," No. 4, Emissions Control.

[9] Based on information from scrubber vendors. Includes approximately 60#/hr hydrocarbons.

[10] Based on AP-42, Supplement No. 1, July 1973.

[11] Foster Wheeler Estimate

Soil stabilizers, dust retardants and surfactants, suppression systems, dry-fabric collection designs and high-efficiency wet scrubbers will be used to minimize air quality degradation of Tract C-a area.

Some control methods to be used during the Modular Development Phase are:

- Mulch soil prior to revegetation.
- Water roads and use dust palliatives.
- Cover haulage conveyor belts.
- Install induced-draft fans and bag house filters at some conveyor transfer points and the crushing buildings.
- Use low sulfur fuel oil in boilers at processing facility.
- Scrub flue gas from thermal oxidizer stack.

Some control methods to be used during the Commercial Phase are:

- Same as Modular Phase, if applicable.
- Desulfurize and purify high BTU gas for fired heaters.
- Scrub flue gases from the preheating systems.
- Use purified fuel gas produced by the MIS retorting operations in the power generators.
- Convert H_2S to elemental sulfur and ammonia to molecular nitrogen from the stripping operation gas.

. Use floating roof tanks for volatile liquids to control hydrocarbon emissions.

Dust control for both Modular Development and Commercial Phase will be accomplished by minimizing land distrubance, frequent watering and prompt revegetation.

b. Issues

(i) Further information summarizing all pollutant sources, emission quantities, and basis of estimates for the Modular Development and Commercial Phases of the planned development.

(ii) Further detail on SO_2 emission sources and modeling results compared with applicable standards.

(iii) Tracer study results were not completed at the time modeling for the DDP was performed. Incorporation of the tracer study results into the modeling may alter results.

(iv) Cumulative impact of emissions, especially particulates, was not considered in the modeling presented in the DDP.

(v) The proposed development appears to exceed Colorado SO_2 standards.

c. Resolution of Issues

(i) In the supplemental material (Appendix B) the lessee provided emission tables for the

Modular Development and Commercial Phases which provided emission quantities by specific pollutant by source including basis of the estimates. These tables are included in part a of this section of the Decision Document above.

(ii) In the supplemental material (Appendix B) the lessee provided tables of SO_2 emission sources and comparison of modeling results with applicable regulation standards.

(iii) The lessee will be required by a specific condition of approval to submit emission modeling results, incorporating tracer study data as appropriate, for Commercial Phase operations.

(iv) The lessee will be required by a specific condition of approval to consider cumulative impacts in modeling for commercial phase operations.

(v) The Colorado Air Pollution Control Commission has adopted new Colorado Ambient Air Standards for sulfur dioxide. The air quality modeling analysis presented in the DDP indicates that these standards could be met.

d. Recommendations

That section 6, Chapter 5 of the DDP be approved subject to the condition of approval below.

e. Conditions of Approval

Emission modeling and detailed air quality control plans for the Commercial Phase will be submitted to the Mining Supervisor for review prior to implementation of Commercial Phase development. This submittal should consider the "Minimum Guidelines for the Detailed Development Air Pollution Control Plans and Modeling" furnished by letter of April 14, 1977, the results of tracer studies, Modular Development Phase emission experience, and cumulative emissions as appropriate.

11. Part 8.2, Water Pollution Control

a. Basic Plan

The water quality control plan to be employed in developing tract C-a is based on the zero discharge water concept. The Oil and Hazardous Material Control Plan, including the Spill Contingency Plan, and the Erosion Control Plan also address systems to control water pollution.

Modular Development Phase

Total water usage under average MDP operating conditions is estimated to be about 965 GPM. Overall water flow is illustrated in Figure 6-6-2. The major portion of the water from mine dewatering wells and treated mine seepage water will be reinjected. The MIS retort water will be evaporated in the thermal oxidizer. Surface runoff and sewage effuent will be recycled for use as process water and dust control. Runoff from the mine service area will be collected in a retention pond. Runoff from the development ore stockpiles will be collected in a series of ditches where sediment will be permitted to settle. All facilities will be designed to withstand a 100-year flood and containment structures will be designed for 150% of tank volumes plus precipitation. A sewage treatment plant will be constructed in the mine service area.

Commercial Phase

Total water usage is estimated to be about 3,530

GPM. Water flow for the Commercial Phase is shown on Figure 6-6-3. Mine seepage water will be treated and combined with water from the up to 38 mine dewatering wells for reinjection. The MIS retort water will be used for process water and for processed shale moisturizing. Rinky Dink Reservoir will store contaminated runoff and leachate from the processed shale disposal pile and will be used for dust control at the disposal site. A plant site retention pond will be constructed in Corral Gulch to collect runoff from the plant site. Surface runoff originating outside of development areas will continue its natural flow, except for a diversion system around the processed shale disposal area and into Box Elder Gulch. Waste water streams from the processing facility will be distilled for steam generation use and used to moisturize processed shale. During the Commercial Phase a process facility sewage treatment plant and a sewage treatment plant near the processed shale disposal area will be constructed.

b. Issues

(i) Details of dewatering, reinjection and augmentation plan and detailed discussion of related aquifer effects were not contained in the DDP.

(ii) Physical and chemical properties and leachability of spent shale in spent retorts and surface disposal areas are not quantified in the DDP.

(iii) Water balances for the Modular Development and Commercial Phases were not included in the DDP.

(iv) The size of water retention facilities and the lining of ponds, reservoirs, and diversion ditches is not complete in the DDP.

c. Resolution of Issues

(i) In the supplemental material (Appendix B) the lessee describes the status of current planning for dewatering, reinjection and hydrologic modeling. The Modular Development Phase dewatering wells are initially planned to surround the shafts and the first 5 retorts at a distance of a few hundred feet. Reinjection wells will be outside this area but within the tract boundary. The optimum arrangement of these wells is currently under study and will be available in the subsurface disposal permit application to the Colorado Department of Health. The effects will be quantified in this permit application and the final augmentation plan now in Water Court Procedings. The lessee has committed to submit copies of the permit applications to the Mining Supervisor for his review.

(ii) In the supplemental material (Appendix B) the lessee provided an outline of a "Research Proposal for Modified In Situ Retort Integrity". This proposed study will investigate subsidence effects of slurry grouting of retorts, leaching conditions and groundwater permeability of spent retorts. Results will be used to determine criteria for commercial retort design. The lessee will be required by a specific condition of approval to implement this program.

(iii) In the supplemental material (Appendix B) the lessee provided water balances for the Modular Development and Commercial Phases that resolves this issue.

(iv) This issue was resolved in Section 7 of this Decision Document.

d. Recommendations

Approval of Section 6, Chapter 6 of the DDP as modified by the supplemental material is recommended, subject to the condition of approval below.

e. Condition of Approval

The lessee shall implement the proposed research proposal for modified in situ retort integrity provided in the supplemental material

to the DDP. The study will emphasize the solubility and mobility of trace and toxic constituents in spent shale and the effects of leaching on the load bearing strength of the rubble filled retort chambers. Prior to commercial operations, a report on the mineralogy and leachability of in situ processed shale on Tract C-a will be submitted.

12. Part 8.3 Oil Spill Contingency Plan

a. Basic Plan

RBOSP will practice prevention as the best plan for minimizing oil spill possibilities (see Section 7, this review). Figure 6-7-1 shows the alert and action flow chart in the event that an oil spill does occur.

If a spill from nontransportation storage facilities should take place, the following actions will occur:

1) Discovery and system shutdown
2) Notification
3) Information gathering
4) Manpower equipment and material availability
5) Containment
6) Removal
7) Cleanup and restoration

Transportation (pipeline) spills would initiate the following steps:

1) Responsibility and notification
2) Locate and identify source of discharge
3) Stop discharge
4) Contain spill
5) Evaluate and cope with hazards
6) Repair and cleanup
7) Evaluate and complete reports

b. Issues

No major issues have been identified in this section of the review.

c. Resolution of Issues

None required.

d. Recommendation

That Section 6, Chapter 7 of the DDP be approved.

13. Part 8.4, Fire Prevention and Control

a. Basic Plan

The RBOSP management will designate a member of the supervisory staff as the project fire control coordinator. The fire prevention and control plan includes preventive measures and emergency procedures during construction, mining, for the processing facility, mobile equipment, stockpiles, crushers, conveyors, baghouses, offices, warehouses, shops, fuel storage and dispensing, and welding and cutting operations. The plan also includes personnel training to provide instruction in safe operating procedures and the use of fire fighting equipment.

b. Issues

No major issues have been identified in this section of the review.

c. Resolution of Issues

None required.

d. Recommendation

That Section 6, Chapter 4 of the DDP be approved.

14. Part 8.5, Disposal of Other Wastes

a. Basic Plan

Solid Wastes

Nonprocess wastes such as paper, organic, glass, nonrecyclable metals and textiles will be disposed of in an existing sanitary landfill during the MDP and in the processed shale disposal pile during the Commercial Phase. Process wastes like lime sludge and spent zeolite will also be placed in the spent shale pile. Spent catalysts from the sulphur plants will be recycled.

Sanitary Wastes

Three sanitary waste treatment plants will be constructed to handle MDP and commercial wastes. The effluents from the mine and process facility treatment plants will flow into the mine retention and plant site retention ponds. The other treatment plant will be located near the processed shale disposal area and effluent will flow into Rinky Dink Reservoir.

Miscellaneous

Waste motor oil will be mixed with diesel fuel and used in diesel equipment. Used antifreeze will be placed in the sanitary sewer system. Diesel tank sludge, waste hydraulic fluid and other waste oil will be burned in the thermal oxidizer.

b. Issues

No major issues have been identified in this section of the review.

c. Resolution of Issues

None required.

d. Recommendation

That Section 6, Chapter 9 of the DDP be approved.

15. Parts 8.6 and 8.7, Protection of Historic, Scientific, and Aesthetic Values

a. Basic Plan

One site has been recognized as qualifing for the National Register of Historic Places on Tract C-a (Figure 6-12-1). A 106/2B statement pursuant to the Antiquities Act is being prepared by BLM. If threatened, the site will be excavated by a qualified archeologist. Equipment operators will be instructed in the recognition of historic and scientific resource material. If material is unearthed, work will stop in the area until the find is cleared. All finds will be reported to BLM, the State Historic Preservation Officer, and the Mining Supervisor.

Natural coloring of buildings, rustic signs, natural shaping of manmade slopes, and minimal vegetative clearing in right-of-ways are among the factors that will be employed to minimize aesthetic landscape impacts on Tract C-a.

b. Issue

Protection of site 5RB13 from disturbance during operations.

c. Resolution of Issue

106/2B Statement of August 18, 1977 from BLM State Director recommends a determination of "No Effect" in recognition of mitigative actions to avoid

adverse effects. Response of August 22, 1977 from State Historic Preservation Officer concurs with a determination of "No Effect". The lessee will be required by a specific condition of approval to comply with the recommended mitigative measures in the 106/2B statement.

d. Recommendations

That section 6, Chapter 10 and 12 of the DDP be approved subject to the condition of approval below.

e. Condition of Approval

The lessee shall maintain a program of continuing observation for items of historic, prehistoric, or scientific value during construction and tract operations. The reporting of uncovered objects shall be in compliance with Section 6 of the Oil Shale Lease Environmental Stipulations. The lessee shall also comply with the measures to avoid adverse effects to sites which qualify for the National Register of Historic Places in the August 16, 1977 "Determination of Effect, C-a Oil Shale Tract, Northwestern Colorado" prepared by the Colorado State Office of the Bureau of Land Management.

16. Part 8.8, Noise Control

a. Basic Plan

The facilities will be designed and operated utilizing the best available technology to achieve compliance with applicable laws, standards, and regulations. Machinery used in crushing will be enclosed. Mobile machinery will be equipped with exhaust controls. Motor carriers will be equipped with adequate mufflers, properly designed tires, and other equipment to meet noise limits. Large compressors and gas turbines will be equipped with sound control devices. Noise exposure to workmen will be controlled by providing sound control enclosures, providing protective equipment, and limiting exposure time. A semi-annual noise monitoring program will be implemented.

b. Issues

No major issues have been identified in this section of the review.

c. Resolution of Issues

None required.

d. Recommendation

That Section 6, Chapter 4 of the DDP be approved.

17. Part 8.9, Fish and Wildlife Management

a. Basic Plan

The Fish and Wildlife Management Plan is designed to mitigate impacts to fish and wildlife habitat through habitat conversion, habitat modification, construction of structural habitat, habitat restoration, improving water availability, and human disturbance control. These plans will be coordinated with the BLM and the Colorado Division of Wildlife.

Pinyon-juniper and possibly sagebrush scrub on and near the tract are probably most amenable to habitat conversion. Mechanical conversion techniques (chaining) and limited controlled burning is recommended for removing the woody vegetation. Suitable vegetative materials removed during construction will be used for brushpiles or windrows to improve protective cover for wildlife. Runoff collectors (guzzlers) could be built to enhance wildlife use of areas that are presently "dry". The revegetation plan (Section 18 of this Decision Document) is designed to create habitat that is at least as valuable for wildlife as habitat presently existing. Human disturbance impacts will be mitigated by distribution of public information, speed limit restrictions, deer crossing signs, hunting and trapping controls, regulation of off-road vehicle use, restricting access to newly restored areas, and prohibiting employee disturbance of wildlife.

A monitoring program will be used to evaluate the plan at several control and treatment sites. The terrestrial habitat modification monitoring program includes evaluation of range productivity and utilization, browse utilization, species composition and percent cover, small mammal abundance, and avifauna studies.

b. Issues

No major issues have been identified in this section of the review.

c. Resolution of Issues

None required.

d. Recommendation

That Section 6, Chapter 11 of the DDP be approved.

18. Part 8.10, Erosion Control and Rehabilitation

a. Basic Plan

Table 6-8-1 shows the yearly estimates of disturbed areas and corresponding revegetation schedule. Soils from all affected areas will be stripped and stockpiled. The stockpiles will then be revegetated to prevent erosion.

On the raw and processed shale piles, the following will be used to control erosion:

- rough slopes (benches along long slopes)
- large rocks to dissipate energy and create shade for plants in selected spots
- pipes, down drains, chutes, and flumes
- straw, emulsions, chemical binders, cellulose fibers, jute netting and mats, plastic netting and mats

When revegetating disturbed areas, seeding will be done during the fall. Small areas will be reseeded by grass and forbes while larger areas (processed shale pile) will be also seeded by shrubs. Preference will be given to native species. Other revegetating factors include straw as mulch, minimal irrigation, fencing to keep out herbivores, and monitoring to check the overall success of the program.

Three experimental sites have been set up on Tract C-a to test the above factors (see Section 6, this review).

Additional information on the rehabilatation of the processed shale pile, particularly the artificial soil profile, may be found in Section 6 of this review.

b. Issue

Revegetation schedule for processed shale pile indicated that the sequential pile construction resulted in a delay before revegetation procedures could be implemented. (See Sections 3 and 6 of this Decision Document)

c. Resolution of Issue

The lessee will be required by a specific condition of approval to evaluate the disposal plan. Resolution of issues in Section 6 of this Decision Document results in a condition of approval which resolves this issue.

d. Recommendation

Approval of Section 6, Chapter 8 of the DDP, subject to the condition of approval contained in Section 6 of this Decision Document.

19. Subsidence Control

a. Basic Plan

Experience gained in rubblizing and retorting during the Modular Development Phase will form the basis for accurate predictions of subsidence, if any, to be anticipated in the Commercial Phase.

Pillar widths for the retort fields will be varied, with thicker pillars in the areas of thicker overburden. It may be desirable to cool the retorts with water upon the completion of a burn to suppress pillar temperature rise and pillar weakening. A subsidence monitoring program will be initiated in the MDP and continue into the Commercial Phase. If subsidence does occur, two broad approaches will be considered: 1) backfilling of burned out retorts and 2) subsidence with appropriate rehabilitation measures.

b. Issues

(i) Integrity of modified in situ retorts and the effect of leaching on their strength.

(ii) Backfilling with raw or spent shale ability to stabilize retorts.

c. Resolution of Issues

(i) See the resolution of issues and condition of approval contained in Section 11 of this Decision Document.

(ii) Resolution of issue (i) above and the associated condition of approval in Section 11 will resolve this issue. Also see the resolution of issues and condition of approval contained in Section 6 of this Decision Document.

d. Recommendation

That Section 6, Chapter 4 of the DDP be approved in consideration of the resolution of issues and condition of approval in Section 11 of this Decision Document.

20. Abandonment

a. Basic Plan

The DDP presents some guidelines for the abandonment of the mine and underground retorts, processing facility, processed shale and development ore disposal sites, and support facilities. Detailed abandonment plans and procedures will be prepared prior to abandonment activities.

Possible methods for abandonment of spent retorts include backfilling with a water slurry, water flushing to leach soluble salts, or isolation of retorts by cement or chemical grout. Shafts and boreholes will be sealed and abandoned.

Abandonment of the processing facility will include:

- all aboveground structures and facilities will be salvaged and removed.
- all concrete structures will be demolished to grade level.
- underground piping will be plugged and abandoned in place.
- all foundations reduced to rubble will be covered with earth.
- graded areas will be recontoured and ponds filled or reshaped.

All areas will then be revegetated.

Abandonment of the processed shale and development ore disposal sites will require little more than completion of the rehabilitation and revegetation activities. Removal of the service roads and conveyors would also be necessary.

Abandonment of the support facilities will be similar to the processing facility. Clean water impoundments, selected roadways, and selected pipelines and powerlines could be left in place for other uses. Existing reservoirs remaining after abandonment and water quality control ponds will be allowed to silt in and serve as a control against flow in the area.

b. Issue

Abandonment plan did not provide method of stabilizing spent retorts and mitigating water quality effects on aquifers.

c. Resolution of Issue

Resolution of the effects will be obtained by the condition of approval developed in Section 11 of this Decision Document. Lessee will also be required by a specific condition of approval to provide details of retort abandonment methods for the Commercial Phase.

d. Recommendation

That Section 6, Chapter 14 of the DDP be approved subject to the condition in Section 11 and subject to the condition of approval below.

e. Condition of Approval

As additional information becomes available the abandonment plan contained in the DDP shall be updated to provide greater detail on retort retirement and stabilization based on the retort integrity study. This information shall be submitted to the Mining Supervisor for review and approval prior to Commercial Phase retort development, and shall emphasize stabilization of in situ retorts, and control of ground water and leaching of the spent retorts.

21. Part 8.11, Health and Safety

a. Basic Plan

The project manager (construction phase) and a member of management (operation phase) will have full responsibility for executing and implementing a program of employee protection and accident prevention. A safety engineer will be employed on the project. A management safety committee will be formed with a member from each major department of the operations.

The health and safety program in the DDP addresses concerns with airborne contaminants, noise control, explosives, electrical facilities, machinery and equipment, first aid and medical facilities, health and sanitation, signs and posters, personal protective and life-saving equipment, protection of the public, and toxic health hazards.

b. Issues

No major issues have been identified in this section of the review.

c. Resolution of Issues

None required

d. Recommendation

That Section 6, Chapter 2 of the DDP be approved.

22. Part 9.0, Environmental Impacts

a. Basic Plan

Development of the tract will affect the air quality, terrestrial and aquatic ecology, surface and subsurface waters, and cultural resources of the area. Matrix analysis indicated that the MDP impacts will generally be less severe than the commercial impacts. The net impact to the region, as discussed in the DDP, is extremely low and will be confined almost exclusively to on-tract lands.

The impacts to ground and surface water hydrology appear to be of greatest importance and severity. Actions affecting the hydrologic system include construction of underground retorts, dewatering/reinjection, and disposal of product and mine water. Subsidence should be minimal if mitigation methods currently being investigated, prove practical.

Impacts on vegetation and fauna will be limited to the tract C-a vicinity. Habitat loss, forage and browse availability and mule deer distribution and migration will be most affected. Habitat modification and revegetation will provide positive impacts. Soils will be impacted from disposal pile construction, cumulative construction disturbance, dewatering, processed shale disposal, and cumulative disposal.

The various development actions will increase the pollutant concentrations in the ambient air and affect the

visibility and noise at the site and in the site region. Because of the low concentration levels that currently exist in the area, even a small release of any pollutant will cause a large percentage increase in concentration. All Federal and State emission standards will be met, but the Colorado category I increment for SO_2 is expected to be exceeded. (See also Section 10 of this Decision Document.)

Erosion and siltation will most significantly affect periphyton and benthos within the aquatic biota. The creation of new aquatic habitat will be a beneficial impact.

Development activities which result in disturbance to the surface and increased human activity in the area have the potential to adversely impact cultural resources. Compliance with appropriate mitigation measures as defined in the 106/2b statement being prepared by the BLM will provide for protection of the cultural resources of the area.

b. Issue

Specific concerns in this area of the review related to the subjective nature of the matrix analysis used by the lessee to quantify the degree of impact relating to proposed development activities and a determination of a need to monitor a particular aspect.

c. Resolution of Issue

Continued review of the Final Baseline report and matrix analysis will be on going. The main issue is monitoring and is discussed in Section 23 of this Decision Document. Specific conditions of approval requiring revision of the monitoring plan based on analysis of the final baseline report are included in that Section.

d. Recommendation

That Section 7 of the DDP be approved subject to conditions of approval in Section 23 of this Decision Document.

23. Part 10.0, Monitoring

a. Basic Plan

Air Quality

Ambient air quality will be monitored at Sites 1, 2, and 3. The long term monitoring program will monitor suspended particulates, sulfur dioxide, nitrogen oxides, methane, non-methane hydrocarbons, carbon monoxide, ozone, and hydrogen sulfide. Visibility will also be monitored to measure regional air quality.

Source emission monitoring and stack sampling will be designed in consultation with the appropriate regulatory agencies. A trace element analysis of the thermal oxidizer flue gas will be made during the Modular Development Phase.

Meteorology

Meteorological conditions will be monitored at three permanent sites (1, 2, and 3). The principal meteorological monitoring site will be located at Site 1, west of the tract boundary, and measure:

wind direction, 10 and 60 m
wind speed, 10 and 60 m
temperature, 10 m
dewpoint, 10 m
total precipitation
solar radiation, 2 m
temperature gradient, 10 m to 60 m
wind sigma meters, 10 and 60 m

Monitoring sites 2 and 3 will measure:

wind direction, 10 m
wind speed, 10 m
temperature, 10 m
wind sigma meter, 10 m

Terrestrial Ecology

Terrestrial programs will monitor the effects of oil shale development on soils, vegetation and animals (Table 8-4-1).

Soil samples will be collected and analyzed for trace metals or other toxic elements concurrently with air quality samples. The soil studies are also designed to detect significant changes in soil salinity or conductivity levels.

The parameters to be measured with respect to the vegetation monitoring program include vegetation type distribution, range productivity and utilization, and browse condition and utilization. Impact and control sites will be located in the pinyon-juniper, mixed brush, and sagebrush vegetative types.

The fauna monitoring program emphasizes important species that could be affected by oil shale development. Predatory mammals, reptiles, and amphibians will not be monitored because their abundance and diversity is low and their value as indicators is questionable. The presence of the greater sandhill crane, whooping crane, and the peregrine falcon warrant continued surveillance. Parameters to be monitored include small mammal abundance, avifauna, mule deer density, feral horse abundance, and rabbit abundance.

Aquatic Ecology

The pond and spring brook habitat type will be monitored at four sites near tract C-a. In addition, 6 sampling sites on Yellow Creek and the White River were selected to monitor the effectiveness of the lessees water quality control plans. Physical measures will include water temperature, dissolved oxygen, pH, specific conductance, flow velocity, depth, width, turbidity, substrate type, alkalinity, suspended solids, and total dissolved solids. Water quality measurements will include calcium, chloride, boron, fluoride, magnesium, potassium, sodium, sulfate, nitrate, orthophosphate, total phosphate, and silica. Periphyton, benthos, and fish will be sampled.

Hydrology

Table 8-6-1 summarizes the hydrology monitoring program. Springs and seeps, surface water, alluvival aquifers, and deep oil shale aquifers will be monitored periodically and/or automatically to detect changes in level or flow and quality. Analyses of baseline data have shown that sodium, fluoride, silica, pH, and alkalinity can be used to trace the origin and flow of groundwater to surface sources.

Revegetation

The revegetation program will emphasize the revegetated processed shale and raw shale ore disposal piles since these areas will be the most difficult to revegetate. Table 8-7-1

summarizes the parameters, sampling techniques, sampling frequency, and sampling intensity for the vegetation, soils, and faunal program to be conducted on the revegetated areas. Vegetation parameters include range productivity and utilization, browse utilization, species composition, and percent cover. General soil properties and trace metals and conductivity will be included in the soil program. Faunal parameters include small mammal abundance and avifauna.

Subsidence and Noise

A subsidence monitoring program was introduced in Section 19 of this Decision Document. Subsidence will be monitored to determine its rate, extent, and effect on drainage patterns. Section 16 introduced a noise monitoring program. Noise will be monitored to assure compliance with worker exposure limits.

b. Issues

(i) The monitoring plan presented in the DDP was considered a conceptual plan as it did not contain monitoring schedules or detailed methodology.

(ii) Consideration should be given to submission of monitoring data in a computer compatible format and on more frequent time periods than the annual report required by the lease.

c. Resolution of Issues

(i) In the supplemental data (Appendix B) the lessee submitted a Scope of Work for the Modular Development Phase Monitoring Program. This scope of work provided the schedules and further details of the monitoring plan in the DDP. The matrix analysis concerns addressed in Section 22 of this Decision Document were mostly resolved by the added detail provided. The lessee will be required by a specific condition of approval to revise the Modular Development Phase Monitoring Program after review of the Final Baseline Report and there after as further information becomes available. The lessee will also be required by a specific condition of approval to submit a detailed Commercial Phase Monitoring Program.

(ii) The lessee will be required by a specific condition of approval to submit environmental monitoring data at such time and in such format as the Mining Supervisor may require.

d. Recommendation

That Section 8 of the DDP be approved subject to the conditions of approval below.

e. Conditions of Approval

(i) Per lease environmental stipulation 1(C)(1), the Modular Development Phase Monitoring Program of August 17, 1977 shall be revised as needed, based on analysis of the final baseline report and thereafter as further information becomes available. Prior to Commercial Phase operations a detailed Commercial Phase Environmental Monitoring Program shall be submitted for review and approval.

(ii) In additon to presentation of environmental monitoring data collected before, during and subsequent to development operations in required annual reports, lessee shall make available to the Mining Supervisor environmental monitoring and other data available at such time and in such format as he may reasonably require.

24. Part 11.0, Alternatives

a. Basic Plan

Alternatives introduced in the DDP include backfilling of burned out retorts, several surface retorting processes, and segregation of dawsonite-bearing oil shale.

Backfilling is presented as a mitigative measure to control subsidence and could also reduce the volume of processed shale which is disposed on the surface. One approach would be to mix a water slurry of spent shale or finely ground raw shale at about 48 weight percent solids and introduce it into the retort after the completion of the burn. Preliminary tests conducted by Amoco Research and work currently underway by Denver Research Institute indicate promising results. Experiments during the MDP will serve to verify the feasibility of this approach. If slurry filling is not feasible, consideration will be given to dry filling the attic space of the retort with either processed shale or raw shale.

The TOSCO II, Union Oil, and Lurgi retorting processes are considered suitable for use on tract C-a in conjunction with in situ retorting. The lessees are continuing to study alternatives for surface retorting and will utilize future advances in technology.

Retorts 6 and up in the MDP are the first retorts from which dawsonite-bearing oil shale could be segregated

for later alumina extraction. Should tonnage quantities of dawsonite-bearing oil shale be needed for test work, the MDP service production shaft and shaft rock pass could be assigned to this service. Surface truck haulage would be used for this small tonnage. During the commercial phase an alternate feed and discharge storage system could be considered for segregation. Dawsonite-bearing oil shale would be stockpiled adjacent to the main primary crushed ore stockpile.

b. Issues

(i) Backfilling is presented as an issue in Sections 6 and 19 of this Decision Document.

(ii) No final decision has been made on the surface retorting process to be utilized during the Commercial Phase.

(iii) The possible desirability of segregation of dawsonite-bearing oil shale for later alumina recovery.

c. Resolution of Issues

(i) The lessee will be required by a specific condition of approval to evaluate underground disposal of processed shale. The resolution of issues in Section 6 of this Decision Document results in a condition of approval which resolves this issue.

(ii) The lessee will be required by a specific condition of approval to submit final design plans to the Mining Supervisor for his review and approval. Resolution of the issue in Section 4 of this Decision Document results in a condition of approval which resolves this issue.

(iii) The lessee will be required by a specific condition of approval to investigate alumina recovery from dawsonite-bearing oil shale.

d. Recommendation

It is recommended that the alternatives portion of Sections 2 and 3 of the DDP be approved subject to the conditions of approval in Sections 4 and 6 of this Decision Document and the condition of approval below.

e. Condition of Approval

The lessee shall investigate the economic and technical feasibility of alumina recovery from dawsonite-bearing oil shale on tract C-a during the mining of commercial size retorts. A report on the results of this investigation shall be submitted to the Mining Supervisor prior to commercial production.

25. Part 12.0, Capitalization

a. Basic Plan

The lessees ultimate goal is to engage in commercial production of shale oil at as high a production rate as is feasible, consistent with economic constraints. Development will proceed initially on a small modular scale to prove the economic feasibility.

A summary of capital and operating costs have been submitted by the lessees under a separate confidential volume to the DDP. The lessee regards this information as proprietary under Section 33 of the lease and 30 CFR 231.5.

b. Issue

Actual investment and operating costs.

c. Resolution of Issue

Requirements of Lease Section 16, together with a specific condition of approval requiring submission of reports at such times as the Mining Supervisor prescribes. Resolution of issues in Section 23 of this Decision Document results in a condition of approval which resolves this issue.

d. Recommendation

Approval of this portion of Volume 4 of the DDP, subject to condition of approval contained in Section 23 of this Decision Document.

26. Part 14.0, Socio-Economics

a. Basic Plan

A "Social and Economic Impact Statement" was prepared by the lessees and submitted to and distributed by the Area Oil Shale Office in March, 1976. This report was updated in May, 1977 to reflect necessary revisions brought about by the change to a modified in situ development of tract C-a.

Over a 9-year period from late 1977 to late 1985, there will be a gradual increase in tract C-a manpower to about 2,500. After 1985, this number will drop off in about 1 year to a constant employment of 2,075 for a 76,000 barrel/day operation. Total induced population caused by the development could reach a peak of 9,250 by 1986 and plateau at 7,680 by 1987.

The key to RBOSP's socio-economic plan is the construction of 22 miles of new road from tract C-a to Rangely, Colorado. Until the road is completed, a majority of employees may be expected to live in Meeker and other communities in Rio Blanco or Garfield Counties. Upon completion of the road, it is expected that growth pressures will center on Rangely.

One of the earliest actions by RBOSP was the contribution of $40,000. to Rio Blanco County to assist in the preparation of a county master plan, which is now complete

and adopted by the county. A portion of the bonus payments made by the lessee has also gone to a State fund to help defray costs for roads, schools, and other aspects within the impacted area.

In 1974, RBOSP appointed a Manager of Community Affairs and he will continue to serve as a liaison to the people and remain active in efforts to assist concerned Western Colorado governmental entities during the development. The RBOSP is also a member of a community impact mitigation task group formed to address oil shale impacts.

GOREDCO was employed in 1975 to work with the town of Rangely in the development of a master plan for growth. The Rangely Master Plan which provides for development under the growth unit concept was adopted by the town of Rangely and certified by the Rio Blanco County Planning Commission in 1976. The document includes residential growth plans, transportation systems, flood protection, water supply, utilities, educational considerations, recreation areas, industrial locations, community services, and agricultural lands.

b. Issues

It is beyond the scope of the Mining Supervisor's authority to approve development plan aspects related to socio-economics, except to enforce Lease Sections 18 through 21 pertaining to employment

practices, equal opportunity, payment of taxes, and fair pricing of products produced from the leased deposit.

Some of the socio-economic concerns addressed during the review process included employee housing, population projections, community infrastructures, government financing and manpower needs, and traffic loads and volumes on existing road networks.

c. Resolution of Issue

The Area Oil Shale Office has encouraged the lessees to work with appropriate agencies and to develop necessary information. The lessee has responded to all the specific socio-economic concerns and questions identified during the review and has committed to respond to any additional requests for information. A meeting was held with the Colorado Division of Highways on August 25, 1977 to identify specific information needs and this data has subsequently been provided to the State.

d. Recommendation

No approval by the Mining Supervisor is required.

27. Lease Administration

a. Basic Plan

The lessee has submitted a Detailed Development Plan prior to the third anniversary date of the lease. The 2 year baseline monitoring program has been completed and the Final Environmental Baseline Report was submitted to the Area Oil Shale Office in May, 1977.

The schedule presented in the DDP shows production commencing in late 1979 from a Modular Development Phase and production from a Commercial Phase in early 1987. The Modular Development Phase includes sequential development of increasing size retorts. This precludes the lessee meeting minimum production requirements during this phase of development and therefore the lessee must pay the minimum royalty required by the lease during this period. Commercial Phase production, scheduled in 1987 (the 13th lease year) is planned to be 76,000 BSP, (barrels per stream day) and is significantly greater than the minimum production required by the lease. The DDP describes a diligent program to obtain production at a rate at least equal to the rate on which minimum royalty is computed.

b. Issue

Section 9 of the lease requires an additional bond upon approval of the DDP.

c. Resolution of Issue

Memorandum to BLM State Director, dated September 7, 1977, recommended that a bond of $300,000 be required of the lease upon approval of the DDP.

d. Recommendations

It is recommended that the DDP be approved.

V. Recommendations

A. Rationale

A decision on the "Revised Detailed Development Plan" was arrived at only after careful consideration of the relevance of the proposed development scheme in relation to lease requirements for a diligent plan that would meet minimum royalty production in an environmentally conscious manner. Public and governmental comments were solicited on the DDP. In addition, the Oil Shale Environmental Advisory Panel consisting of representatives from concerned Federal, State, and local government agencies and private organizations, reviewed and advised the Mining Supervisor on the environmental aspects of the plan.

The problems which resulted in a suspension of operations on September 1, 1976 have been resolved. The air quality control problem has been resolved by EPA through utilization of interpretive rulings, existing regulations, and policy statements that indicate if a facility is designed to meet all applicable State and Federal emmission regulations and incremental ambient standards, it may be constructed. The Colorado Air Pollution Control Commission has adopted new Colorado Ambient Air Standards for sulfur dioxide. The air quality modeling analysis presented in the DDP indicates that these standards could be met. The off-tract land problem was resolved by the lessees decision to alter the scheme of development from open pit mining and surface

retorting to modified in situ methods.

During the technical and public review of the modified plan, several areas warranting further technical clarification were identified. The lessee has provided needed supplemental data as part of the DDP. The issues identified in Part IV of this decision document have either been resolved by this supplemental material or will be resolved by special conditions of approval.

It should also be noted that the tract area has been previously surveyed and cleared regarding significant historical and cultural values.

B. Recommendation

It is the opinion of this office that the "Revised Detailed Development Plan", dated May 1977, and the supplemental material, dated September 2, 1977 constitute an acceptable and diligent Detailed Development Plan under Section 10(a) of the Lease, provided terms of the following conditions of approval are fully adhered to. These conditions constitute a synthesis of those recommended in Part IV of this document. Approval grants the lessee the right to proceed with development of the leased oil shale deposits on Tract C-a by the modified in situ methods described in the DDP in accordance with terms of the Lease, and with the environmental control plans set forth therein and in the Oil Shale Lease Environmental Stipulations. Development can commence at such time as the terms of the conditions of approval are acknowledged, and

those actions required prior to commencement of development have been achieved.

Granting approval will in no way waiver the obligation of the lessee to fully comply with all terms of the Lease and Environmental Stipulations, which shall be strictly enforced by this office under penalty of termination of operations, or with the requirement incumbent upon the lessee to obtain and comply with all applicable Federal, State, and local permits, laws, and regulations. All development and environmental control work on tract must proceed in accordance with the approved plan. Should it become necessary to further modify or change this plan, any such changes must first be approved in writing by the Mining Supervisor pursuant to Section 10 (b) of the Lease. With approval, notice will be given, that a complete copy of the approved plan and conditions are available for public inspection at the office of the Area Oil Shale Mining Supervisor and at the administrative office of the lessee, on tract. In addition, reports covering all environmental baseline data; tract exploration; and forthcoming development, production, and environmental monitoring will also be available at the office of the Area Oil Shale Mining Supervisor for public inspection.

The "Revised Detailed Development Plan" will be considered approved as conditioned, upon the acceptance by the lessee of the following terms:

1. Prior to commencing any operations under the Modular Development Phase of the Detailed Development Plan (DDP), the lessee shall submit final design plans, as requested by the Mining Supervisor, for his review, as to adherence to the DDP, to the terms of the Oil Shale Lease, and to the requirements of 30 CFR Part 231 and 43 CFR Part 23 or any subsequent applicable revisions thereof.

2. Prior to commencing construction of Commercial Phase facilities, the lessee shall submit plans, as required by the Mining Supervisor, for his review and approval as to adherence to the plan of action contained in the DDP, to the terms of the Oil Shale Lease, and to the requirements of 30 CFR Part 231 and 43 CFR Part 23 or any subsequent applicable revisions thereof.

3. Per lease environmental stipulation 1(c)(1), the Modular Development Phase Monitoring Program of August 17, 1977 shall be revised as needed, based on analysis of the final baseline report, and thereafter as further information becomes available. Prior to Commercial Phase operations a detailed Commercial Phase Environmental Monitoring Program shall be submitted for review and approval.

4. In addition to presentation of environmental monitoring data collected before, during and subsequent to development operations in required annual reports, lessee shall make available to the Mining Supervisor environmental monitoring and other data at such time and in such format as he may reasonably require.

5. The lessee will incorporate the best available environmental control technology in all phases of the Modular and Commercial development. Environmental control plans shall be reviewed and revised, as needed, prior to implementation of the Commercial Phase development.

6. Prior to Commercial Phase operations, surface processed shale disposal plans shall be evaluated in consideration of optimizing the revegetation schedule with pile development. The lessee shall continue to evaluate the alternative for underground disposal of processed shale.

7. Emission modeling and detailed air quality control plans for the commercial phase will be submitted to the Mining Supervisor for review prior to implementation of Commercial Phase development. This submittal should consider the "Minimum Guidelines for the Detailed Development Air Pollution Control Plans and Modeling" furnished by letter of April 14, 1977, the results of tracer studies,

Modular Development Phase emission experience, and cumulative emissions as appropriate.

8. As additional information becomes available the abandonment plan contained in the DDP shall be updated to provide greater detail on retort retirement and stabilization based on the retort integrity study. This information shall be submitted to the Mining Supervisor for review and approval prior to commercial phase retort development, and shall emphasize stabilization of in situ retorts and control of ground water and leaching of the spent retorts.

9. The lessee shall implement the proposed research proposal for modified in situ retort integrity provided in the supplemental material to the DDP. The study will emphasize the solubility and mobility of trace and toxic constituents in spent shale and the effects of leaching on the load bearing strength of the rubble filled retort chambers. Prior to commercial operations, a report on the mineralogy and leachability of in situ processed shale on Tract C-a will be submitted.

10. The lessee shall investigate the economic and technical feasibility of alumina recovery from dawsonite-bearing oil shale on tract C-a during the mining of commercial size retorts during the Modular Development Phase. A report on the results of this investigation shall be submitted to the Mining Supervisor prior to commercial production.

11. The lessee shall maintain a program of continuing observation for items of historic, prehistoric, or scientific value during construction and tract operations. The reporting of uncovered objects shall be in compliance with Section 6 of the Oil Shale Lease Environmental Stipulations. The lessee shall also comply with the measures to avoid adverse effects to sites which qualify for the National Register of Historic Places in the August 16, 1977, "Determination of Effect, C-a Oil Shale Tract, Northwestern Colorado", prepared by the Colorado State Office of the Bureau of Land Management.

Form 1279–3
(June 1984)

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Geological Survey
Area Oil Shale Sup
Prototype oil shale
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